APPENDIX

Dynamic Modelling and Control Design of a Pediatric Robotic Lower-Limb Exoskeleton

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For the right leg of a coupled human-exoskeleton system with 5 DOFs, the inertia matrix $M(q)$, Coriolis and centripetal matrix $C(q,\dot{q})$, gravity vector $G(q)$, and torque vector τ are provided below:

A. INERTIA MATRIX ($M(q)$)

$$M(q) = \begin{bmatrix} M_{11} & M_{12} & M_{13} & M_{14} & M_{15} \\ M_{21} & M_{22} & M_{23} & M_{24} & M_{25} \\ M_{31} & M_{32} & M_{33} & M_{34} & M_{35} \\ M_{41} & M_{42} & M_{43} & M_{44} & M_{45} \\ M_{51} & M_{52} & M_{53} & M_{54} & M_{55} \end{bmatrix} \tag{A1}$$

where

$$M_{11} = I_{yy,1} + I_{zz,2} + I_{zz,3} + I_{zz,4} + I_{zz,5} + 0.25\,{a_1}^2\,m_1 + {a_1}^2\,m_2 + {a_1}^2\,m_3 + 0.25\,{a_2}^2\,m_2 + {a_1}^2\,m_4 + {a_2}^2\,m_3 + {a_1}^2\,m_5 + {a_2}^2\,m_4 + 0.25\,{a_3}^2\,m_3 + {a_2}^2\,m_5 + {a_3}^2\,m_4 + {a_3}^2\,m_5 + 0.25\,{a_4}^2\,m_4 + {a_4}^2\,m_5 + 0.25\,{a_5}^2\,m_5 + {\mathrm{lc}_{2,1}}^2\,m_2 + {\mathrm{lc}_{2,2}}^2\,m_2 + {\mathrm{lc}_{3,1}}^2\,m_3 + {\mathrm{lc}_{3,2}}^2\,m_3 + {\mathrm{lc}_{4,1}}^2\,m_4 + {\mathrm{lc}_{4,2}}^2\,m_4 + {\mathrm{lc}_{5,1}}^2\,m_5 + {\mathrm{lc}_{5,2}}^2\,m_5 + {\mathrm{lc}_1}^2\,m_1 + {\mathrm{lc}_3}^2\,m_1 + I_{xx,2}\cos(\theta_2)^2 + I_{xx,3}\cos(\theta_2)^2 + I_{yy,4}\cos(\theta_2)^2 + I_{yy,5}\cos(\theta_2)^2 - I_{zz,2}\cos(\theta_2)^2 - I_{zz,3}\cos(\theta_2)^2 - I_{zz,4}\cos(\theta_2)^2 - I_{zz,5}\cos(\theta_2)^2 - I_{xx,3}\cos(\theta_2)^2\cos(\theta_3)^2 + I_{xx,4}\cos(\theta_2)^2\cos(\theta_3)^2 + I_{xx,4}\cos(\theta_2)^2\cos(\theta_4)^2 + I_{xx,5}\cos(\theta_2)^2\cos(\theta_3)^2 + I_{xx,5}\cos(\theta_2)^2\cos(\theta_4)^2 + I_{xx,5}\cos(\theta_2)^2\cos(\theta_5)^2 + I_{yy,3}\cos(\theta_2)^2\cos(\theta_3)^2 - I_{yy,4}\cos(\theta_2)^2\cos(\theta_3)^2 - I_{yy,4}\cos(\theta_2)^2\cos(\theta_4)^2 - I_{yy,5}\cos(\theta_2)^2\cos(\theta_3)^2 - I_{yy,5}\cos(\theta_2)^2\cos(\theta_4)^2 - I_{yy,5}\cos(\theta_2)^2\cos(\theta_5)^2 + 2\,I_{xz,2}\,\cos(\theta_2)\,\sin(\theta_2) + a_2\,\mathrm{lc}_{2,1}\,m_2 + a_3\,\mathrm{lc}_{3,1}\,m_3 + a_4\,\mathrm{lc}_{4,1}\,m_4 + a_5\,\mathrm{lc}_{5,1}\,m_5 + a_1\,\mathrm{lc}_1\,m_1 - 0.25\,{a_2}^2\,m_2\cos(\theta_2)^2 - {a_2}^2\,m_3\cos(\theta_2)^2 - {a_2}^2\,m_4\cos(\theta_2)^2 - 0.25\,{a_3}^2\,m_3\cos(\theta_2)^2 - {a_2}^2\,m_5\cos(\theta_2)^2 - {a_3}^2\,m_4\cos(\theta_2)^2 - {a_3}^2\,m_5\cos(\theta_2)^2 - {\mathrm{lc}_{2,1}}^2\,m_2\cos(\theta_2)^2 + {\mathrm{lc}_{2,3}}^2\,m_2\cos(\theta_2)^2 - {\mathrm{lc}_{3,1}}^2\,m_3\cos(\theta_2)^2 + {\mathrm{lc}_{3,3}}^2\,m_3\cos(\theta_2)^2 - {\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)^2 + {\mathrm{lc}_{4,3}}^2\,m_4\cos(\theta_2)^2 - {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2 + {\mathrm{lc}_{5,3}}^2\,m_5\cos(\theta_2)^2 + {\mathrm{lc}_{3,1}}^2\,m_3\cos(\theta_2)^2\cos(\theta_3)^2 - {\mathrm{lc}_{3,2}}^2\,m_3\cos(\theta_2)^2\cos(\theta_3)^2 - {\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2 - {\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)^2\cos(\theta_4)^2 + {\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2 + {\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)^2\cos(\theta_4)^2 - {\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2 - {\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2 + {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2 - {\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_5)^2 + {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2 + {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_5)^2 + 2\,I_{yz,3}\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2) - 2\,I_{xx,4}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 - 2\,I_{xx,5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 - 2\,I_{xx,5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2 - 2\,I_{xx,5}\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 2\,I_{yy,4}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 + 2\,I_{yy,5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 + 2\,I_{yy,5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2 + 2\,I_{yy,5}\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 2\,I_{xz,3}\,\cos(\theta_2)\,\sin(\theta_2)\,\sin(\theta_3) + a_3\,a_4\,m_4\,\cos(\theta_4) + 2\,a_3\,a_4\,m_5\,\cos(\theta_4) + 2\,a_1\,\mathrm{lc}_{2,3}\,m_2\,\cos(\theta_2) + 2\,a_1\,\mathrm{lc}_{3,3}\,m_3\,\cos(\theta_2) + 2\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\cos(\theta_3) + 2\,a_1\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_2) + 2\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_4) + 2\,a_1\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_2) - 2\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_5) - a_1\,a_2\,m_2\,\sin(\theta_2) - 2\,a_1\,a_2\,m_3\,\sin(\theta_2) - 2\,a_1\,a_2\,m_4\,\sin(\theta_2) - 2\,a_1\,a_2\,m_5\,\sin(\theta_2) + a_2\,a_3\,m_3\,\sin(\theta_3) + 2\,a_2\,a_3\,m_4\,\sin(\theta_3) + 2\,a_2\,a_3\,m_5\,\sin(\theta_3) - a_4\,a_5\,m_5\,\sin(\theta_5) - 2\,a_1\,\mathrm{lc}_{2,1}\,m_2\,\sin(\theta_2) + 2\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\sin(\theta_3) - 2\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\sin(\theta_4) - 2\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\sin(\theta_5) + 2\,I_{xy,3}\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3) - 2\,I_{xy,4}\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3) - 2\,I_{xy,5}\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3) - 2\,I_{xy,4}\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4) - 2\,I_{xy,5}\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4) - 2\,I_{xy,5}\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5) - a_2\,\mathrm{lc}_{2,1}\,m_2\cos(\theta_2)^2 - a_3\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)^2 + 0.25\,{a_3}^2\,m_3\cos(\theta_2)^2\cos(\theta_3)^2 + {a_3}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2 + {a_3}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2 - 0.25\,{a_4}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2 - 0.25\,{a_4}^2\,m_4\cos(\theta_2)^2\cos(\theta_4)^2 - {a_4}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2 - {a_4}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2 - 0.25\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2 - 0.25\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2 -$$

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\begin{aligned}
&0.25\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_5)^2+a_3\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)^2\cos(\theta_3)^2-a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2-a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_4)^2-\\
&a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2-a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2-a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_5)^2+2\,I_{\mathrm{yz},4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)+\\
&2\,I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)+2\,I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)+0.5\,{a_4}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+\\
&2\,{a_4}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+\\
&0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-2\,I_{\mathrm{yz},4}\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+2\,{\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-\\
&2\,{\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-\\
&2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-\\
&2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2+2\,a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)-2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)+\\
&a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_4)+a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_3)+2\,a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_4)+2\,a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_3)-\\
&a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5)-a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4)-a_2\,\mathrm{lc}_{2,3}\,m_2\cos(\theta_2)\sin(\theta_2)-2\,a_1\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3)\sin(\theta_2)-\\
&2\,a_2\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_2)-2\,a_2\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_2)+2\,a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4)+2\,a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3)-\\
&2\,a_2\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_2)-2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5)-2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4)-a_1\,a_3\,m_3\sin(\theta_2)\sin(\theta_3)-\\
&2\,a_1\,a_3\,m_4\sin(\theta_2)\sin(\theta_3)-2\,a_1\,a_3\,m_5\sin(\theta_2)\sin(\theta_3)-2\,\mathrm{lc}_{2,1}\,\mathrm{lc}_{2,3}\,m_2\cos(\theta_2)\sin(\theta_2)-2\,a_1\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_2)\sin(\theta_3)-\\
&2\,a_2\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4)+2\,a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5)+4\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-\\
&4\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-a_3\,a_4\,m_4\cos(\theta_2)^2\cos(\theta_4)-2\,a_3\,a_4\,m_5\cos(\theta_2)^2\cos(\theta_4)-\\
&2\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)^2\cos(\theta_3)-2\,a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_4)-a_2\,a_3\,m_3\cos(\theta_2)^2\sin(\theta_3)-2\,a_2\,a_3\,m_4\cos(\theta_2)^2\sin(\theta_3)-\\
&2\,a_2\,a_3\,m_5\cos(\theta_2)^2\sin(\theta_3)-2\,a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)^2\sin(\theta_3)+2\,a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\sin(\theta_4)+4\,I_{\mathrm{xy},4}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+\\
&4\,I_{\mathrm{xy},4}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)+\\
&4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)+\\
&4\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-8\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-8\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-\\
&8\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-2\,I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)-2\,I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)-\\
&2\,I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)+2\,I_{\mathrm{yz},5}\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+\\
&2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)-2\,a_1\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)-2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)-\\
&2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)-2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-a_1\,a_4\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-\\
&a_1\,a_4\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)-2\,a_1\,a_4\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-2\,a_1\,a_4\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)-\\
&a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)-a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)-a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-\\
&2\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)+2\,a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+\\
&2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)-\\
&2\,a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-2\,a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)-2\,a_3\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)-\\
&2\,a_3\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)-2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)-2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)-\\
&2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-2\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)+2\,a_1\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+\\
&2\,a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+2\,I_{\mathrm{xx},4}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+2\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+\\
&2\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+2\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-2\,I_{\mathrm{yy},4}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-\\
&2\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-2\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-2\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-4\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+4\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-\\
&2\,a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)+2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)-a_2\,a_4\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_4)-\\
&a_2\,a_4\,m_4\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_3)-2\,a_2\,a_4\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_4)-2\,a_2\,a_4\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_3)+
\end{aligned}
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\begin{aligned}
&a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_5)+a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_4)-a_3\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)-\\
&2\,a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_4)-2\,a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_3)+a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)+\\
&a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4)+2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_5)+2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_4)+\\
&a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)+a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4)+a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5)-\\
&2\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)+2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)+2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4)+\\
&2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)+2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4)+2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5)+\\
&2\,a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\sin(\theta_3)\sin(\theta_4)-2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\sin(\theta_4)\sin(\theta_5)+a_3\,a_4\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)+\\
&2\,a_3\,a_4\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)+2\,a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)+2\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)+\\
&2\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)+a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\sin(\theta_5)+a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\sin(\theta_5)+\\
&2\,I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-2\,a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\sin(\theta_4)+2\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\sin(\theta_5)+\\
&2\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\sin(\theta_5)-2\,I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)-2\,I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)-\\
&2\,I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)-2\,a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-2\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)-\\
&4\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)-a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)+\\
&2\,a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)+2\,a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)+2\,a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)-\\
&2\,a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-2\,a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)-2\,a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_5)+\\
&a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)-\\
&2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)-4\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_5)+\\
&2\,a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+2\,a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+2\,a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+\\
&2\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)-2\,a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-0.5\,{a_4}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-\\
&2\,{a_4}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-\\
&0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-0.5\,{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&a_2\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)-2\,{\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+2\,{\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-\\
&2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-\\
&2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-\\
&2\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+2\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)+a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)+a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)-\\
&2\,a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)+2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)+2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)+\\
&2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)+2\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)+2\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)-\\
&a_3\,a_4\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)-2\,a_3\,a_4\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)+a_2\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+\\
&a_2\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+a_2\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-4\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-\\
&2\,a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)+2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+\\
&2\,a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-2\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_5)-2\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4)\sin(\theta_5)-\\
&2\,a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-4\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-\\
&4\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-4\,I_{\mathrm{xx},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+\\
&4\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+4\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+\\
&4\,I_{\mathrm{yy},5}\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)-
\end{aligned}
$$

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\begin{aligned}
&a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_5)-a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_4)-2\,a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-\\
&2\,a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_5)-2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_4)-\\
&2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)-2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-\\
&2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)-2\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-\\
&4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-\\
&4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)-4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-\\
&4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)-4\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\sin(\theta_4)\sin(\theta_5)-\\
&a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)+a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+\\
&a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+8\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)+\\
&8\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+8\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+\\
&2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+\\
&2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)-2\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+\\
&8\,I_{\mathrm{xy},5}\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-\\
&2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-2\,a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+\\
&2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+2\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-\\
&2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-\\
&2\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+a_3\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+\\
&2\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+\\
&{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+{a_5}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+\\
&4\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+4\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-\\
&4\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+4\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&4\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-4\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&2\,a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)-2\,a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)-\\
&4\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)-4\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)+\\
&4\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)\sin(\theta_5)+4\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)\sin(\theta_5)-\\
&a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-2\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)+\\
&2\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)+2\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)+\\
&2\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)+4\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)+\\
&4\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+4\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+\\
&4\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+2\,a_4\,a_5\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+\\
&4\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+4\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+\\
&4\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+4\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-\\
&4\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-8\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)
\end{aligned}
\tag{A2}
$$

$$M_{12} = I_{xy,4}\cos(\theta_2) - I_{xy,3}\cos(\theta_2) - I_{xy,2}\cos(\theta_2) + I_{xy,5}\cos(\theta_2) - I_{yz,2}\sin(\theta_2) + I_{xz,3}\cos(\theta_3)\sin(\theta_2) -$$
$$I_{yz,3}\sin(\theta_2)\sin(\theta_3)+2.0\,I_{xy,3}\cos(\theta_2)\cos(\theta_3)^2-2.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_3)^2-2.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_4)^2-2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2-$$
$$2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_4)^2-2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_5)^2+I_{xx,3}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-I_{xx,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-$$
$$I_{xx,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-I_{xx,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)-I_{xx,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+I_{xz,4}\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)-$$
$$I_{xx,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_5)-I_{yy,3}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+I_{yy,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+I_{yy,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+$$
$$I_{yy,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+I_{yy,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+I_{yy,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_5)-I_{yz,4}\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)-$$
$$I_{yz,4}\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - I_{xz,4}\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,lc_{2,2}\,m_2\cos(\theta_2) + 0.5\,a_3\,lc_{3,2}\,m_3\cos(\theta_2) -$$
$$0.5\,a_4\,lc_{4,2}\,m_4\cos(\theta_2)-0.5\,a_5\,lc_{5,2}\,m_5\cos(\theta_2)+lc_{2,1}\,lc_{2,2}\,m_2\cos(\theta_2)+lc_{3,1}\,lc_{3,2}\,m_3\cos(\theta_2)-lc_{4,1}\,lc_{4,2}\,m_4\cos(\theta_2)-$$
$$lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_2)+lc_{2,2}\,lc_{2,3}\,m_2\sin(\theta_2)+4.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2+4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2+4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2-I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-$$
$$0.25\,{a_3}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-{a_3}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-{a_3}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+0.25\,{a_4}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+$$
$${a_4}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+0.25\,{a_4}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+{a_4}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+$$
$$0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5)-8.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)-I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)-I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)-$$
$${lc_{3,1}}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+{lc_{3,2}}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+{lc_{4,1}}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-{lc_{4,2}}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+$$
$${lc_{4,1}}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)-{lc_{4,2}}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+{lc_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-{lc_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)+$$
$${lc_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)-{lc_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)+{lc_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5)-{lc_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5)+$$
$$I_{yz,5}\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+I_{yz,5}\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+I_{yz,5}\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)-$$
$$0.5\,a_2\,a_3\,m_3\cos(\theta_2)\cos(\theta_3)-a_2\,a_3\,m_4\cos(\theta_2)\cos(\theta_3)-a_2\,a_3\,m_5\cos(\theta_2)\cos(\theta_3)-0.5\,a_4\,a_5\,m_5\cos(\theta_2)\cos(\theta_5)+$$
$$I_{xz,5}\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-a_2\,lc_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3)+a_3\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)-a_4\,lc_{5,1}\,m_5\cos(\theta_2)\cos(\theta_5)+$$
$$0.5\,a_3\,a_4\,m_4\cos(\theta_2)\sin(\theta_4)+a_3\,a_4\,m_5\cos(\theta_2)\sin(\theta_4)+a_2\,lc_{3,2}\,m_3\cos(\theta_2)\sin(\theta_3)-0.5\,a_3\,lc_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2)+$$
$$a_3\,lc_{4,1}\,m_4\cos(\theta_2)\sin(\theta_4)-a_3\,lc_{4,3}\,m_4\cos(\theta_3)\sin(\theta_2)-a_3\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_2)+a_4\,lc_{5,2}\,m_5\cos(\theta_2)\sin(\theta_5)-$$
$$lc_{3,1}\,lc_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2)+lc_{3,2}\,lc_{3,3}\,m_3\sin(\theta_2)\sin(\theta_3)+2.0\,I_{xx,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+2.0\,I_{xx,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+$$
$$2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)+2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+$$
$$2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)+2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-$$
$$2.0\,I_{yy,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-2.0\,I_{yy,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-$$
$$2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)-2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)-2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-a_3\,lc_{3,2}\,m_3\cos(\theta_2)\cos(\theta_3)^2+$$
$$a_4\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)^2+a_4\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)^2+a_5\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_3)^2+a_5\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)^2+$$
$$a_5\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)^2-2.0\,lc_{3,1}\,lc_{3,2}\,m_3\cos(\theta_2)\cos(\theta_3)^2+2.0\,lc_{4,1}\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)^2+2.0\,lc_{4,1}\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)^2+$$
$$2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_3)^2+2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)^2+2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)^2-0.5\,a_2\,a_4\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)-$$
$$a_2\,a_4\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5) - a_2\,lc_{4,1}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) +$$
$$a_3\,lc_{5,1}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5) - a_3\,lc_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + a_2\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) +$$
$$a_2\,lc_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) + a_4\,lc_{4,1}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + a_4\,lc_{4,1}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) -$$
$$0.5\,a_4\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)+a_5\,lc_{5,1}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)-a_3\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)-$$
$$a_3\,lc_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_4) - a_4\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + a_5\,lc_{5,1}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) +$$
$$a_5\,lc_{5,1}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) + 0.5\,a_2\,a_4\,m_4\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_2\,a_4\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) -$$

$$0.5\,a_3\,a_5\,m_5\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,{a_4}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$$
$$0.5\,{a_4}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{a_4}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-2.0\,{a_4}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)+$$
$$a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)-2.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)+$$
$$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)-a_3\,a_4\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-2.0\,a_3\,a_4\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-$$
$$2.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_5)-$$
$$4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,I_{\mathrm{xy},4}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$2.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)-2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)-2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$

$$
\begin{aligned}
&a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+\\
&{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+\\
&4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+\\
&4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-\\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)-4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+\\
&4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-a_3\,a_4\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)-\\
&2.0\,a_3\,a_4\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)+0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+\\
&0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)+\\
&4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+\\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+\\
&4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+\\
&4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+\\
&4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\\
&2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-\\
&8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)
\end{aligned}
\tag{A3}
$$

$$M_{13} = I_{yz,4}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) - I_{zz,4}\sin(\theta_2) - I_{zz,5}\sin(\theta_2) - I_{yz,3}\cos(\theta_2)\cos(\theta_3) - I_{xz,3}\cos(\theta_2)\sin(\theta_3) - 0.25\,{a_3}^2\,m_3\sin(\theta_2) - {a_3}^2\,m_4\sin(\theta_2) - {a_3}^2\,m_5\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\sin(\theta_2) - {a_4}^2\,m_5\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\sin(\theta_2) - {\mathrm{lc}_{3,1}}^2\,m_3\sin(\theta_2) - {\mathrm{lc}_{3,2}}^2\,m_3\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{4,2}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{5,1}}^2\,m_5\sin(\theta_2) - {\mathrm{lc}_{5,2}}^2\,m_5\sin(\theta_2) - I_{yz,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - I_{xz,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) - I_{xz,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - I_{zz,3}\sin(\theta_2) + a_1\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3) + 0.5\,a_1\,a_3\,m_3\sin(\theta_3) + a_1\,a_3\,m_4\sin(\theta_3) + a_1\,a_3\,m_5\sin(\theta_3) + a_1\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_3) - a_3\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_2) - a_4\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_2) - a_5\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2) - I_{xz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_3)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_4)\sin(\theta_2) + a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_5)\sin(\theta_2) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{yz,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + I_{xz,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{yz,5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.25\,a_2\,a_3\,m_3\cos(\theta_2)\cos(\theta_3) + 0.5\,a_2\,a_3\,m_4\cos(\theta_2)\cos(\theta_3) + 0.5\,a_2\,a_3\,m_5\cos(\theta_2)\cos(\theta_3) + 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3) + a_1\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4) - a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4) - a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_5) + 0.5\,a_1\,a_4\,m_4\cos(\theta_3)\sin(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_4)\sin(\theta_3) + a_1\,a_4\,m_5\cos(\theta_3)\sin(\theta_4) + a_1\,a_4\,m_5\cos(\theta_4)\sin(\theta_3) - 0.5\,a_3\,a_4\,m_4\cos(\theta_2)\sin(\theta_4) - 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) - a_3\,a_4\,m_5\cos(\theta_2)\sin(\theta_4) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + \mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\cos(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)\sin(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_3) + 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\sin(\theta_4) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3) + a_3\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\sin(\theta_5) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) - 0.25\,a_2\,a_3\,m_3\sin(\theta_2)\sin(\theta_3) - 0.5\,a_2\,a_3\,m_4\sin(\theta_2)\sin(\theta_3) - 0.5\,a_2\,a_3\,m_5\sin(\theta_2)\sin(\theta_3) + a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) + \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) - 0.25\,a_2\,a_3\,m_3\cos(\theta_3)\cos(\theta_2) - 0.5\,a_2\,a_3\,m_4\cos(\theta_3)\cos(\theta_2) - 0.5\,a_2\,a_3\,m_5\cos(\theta_3)\cos(\theta_2) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_3)\cos(\theta_2) + a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_4)\cos(\theta_2) + a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\cos(\theta_2) - 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) + 0.5\,a_3\,a_4\,m_4\sin(\theta_4)\cos(\theta_2) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + a_3\,a_4\,m_5\sin(\theta_4)\cos(\theta_2) - 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\sin(\theta_3)\cos(\theta_2) - 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\sin(\theta_3)\cos(\theta_2) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_4)\cos(\theta_2) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) - a_4\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_5)\cos(\theta_2) - 0.25\,a_2\,a_3\,m_3\sin(\theta_3)\sin(\theta_2) - 0.5\,a_2\,a_3\,m_4\sin(\theta_3)\sin(\theta_2) - 0.5\,a_2\,a_3\,m_5\sin(\theta_3)\sin(\theta_2) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + 2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - 0.5\,a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - 0.5\,a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - 2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) \tag{A4}$$

$$M_{14} = I_{yz,4}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) - I_{zz,5}\sin(\theta_2) - 0.25\,a_4{}^2\,m_4\sin(\theta_2) - a_4{}^2\,m_5\sin(\theta_2) - 0.25\,a_5{}^2\,m_5\sin(\theta_2) - \mathrm{lc}_{4,1}{}^2\,m_4\sin(\theta_2) - \mathrm{lc}_{4,2}{}^2\,m_4\sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\,m_5\sin(\theta_2) - \mathrm{lc}_{5,2}{}^2\,m_5\sin(\theta_2) - I_{yz,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - I_{xz,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) - I_{xz,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - I_{zz,4}\sin(\theta_2) - a_4\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_2) - a_5\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2) - I_{xz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{yz,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + I_{xz,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{yz,5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + a_1\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_3)\sin(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_4)\sin(\theta_3) + a_1\,a_4\,m_5\cos(\theta_3)\sin(\theta_4) + a_1\,a_4\,m_5\cos(\theta_4)\sin(\theta_3) - 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + 2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) + a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) - a_1\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_4) + 2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - 0.5\,a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - 0.5\,a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) \tag{A5}$$

$$M_{15} = I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.25\,a_5{}^2\,m_5\sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\,m_5\sin(\theta_2) - \mathrm{lc}_{5,2}{}^2\,m_5\sin(\theta_2) - a_5\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2) - I_{xz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - I_{zz,5}\sin(\theta_2) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{yz,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + I_{xz,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{yz,5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) + 0.5\,a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) + a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) \tag{A6}$$

$$M_{21} = I_{xy,4}\cos(\theta_2) - I_{xy,3}\cos(\theta_2) - I_{xy,2}\cos(\theta_2) + I_{xy,5}\cos(\theta_2) - I_{yz,2}\sin(\theta_2) + I_{xz,3}\cos(\theta_3)\sin(\theta_2) -$$
$$I_{yz,3}\sin(\theta_2)\sin(\theta_3) + 2.0\,I_{xy,3}\cos(\theta_2)\cos(\theta_3)^2 - 2.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_3)^2 - 2.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_4)^2 -$$
$$2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2 - 2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_4)^2 - 2.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_5)^2 + I_{xx,3}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) -$$
$$I_{xx,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - I_{xx,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - I_{xx,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) - I_{xx,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) +$$
$$I_{xz,4}\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) - I_{xx,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) - I_{yy,3}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + I_{yy,4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) +$$
$$I_{yy,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + I_{yy,4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) + I_{yy,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) + I_{yy,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) -$$
$$I_{yz,4}\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - I_{yz,4}\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - I_{xz,4}\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,\mathrm{lc}_{2,2}\,m_2\cos(\theta_2) +$$
$$0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2) - 0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2) + \mathrm{lc}_{2,1}\,\mathrm{lc}_{2,2}\,m_2\cos(\theta_2) + \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2) -$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2) + \mathrm{lc}_{2,2}\,\mathrm{lc}_{2,3}\,m_2\sin(\theta_2) + 4.0\,I_{xy,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 + 4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 +$$
$$4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2 + 4.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2 - I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) -$$
$$0.25\,{a_3}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - {a_3}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - {a_3}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + 0.25\,{a_4}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) +$$
$$ {a_4}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + 0.25\,{a_4}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) +$$
$$ {a_4}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) -$$
$$8.0\,I_{xy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 - I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) - I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) -$$
$$I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - {\mathrm{lc}_{3,1}}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + {\mathrm{lc}_{3,2}}^2\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) +$$
$${\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - {\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + {\mathrm{lc}_{4,1}}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) - {\mathrm{lc}_{4,2}}^2\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) +$$
$${\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + {\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) - {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) +$$
$${\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) - {\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) + I_{yz,5}\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) +$$
$$I_{yz,5}\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + I_{yz,5}\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - 0.5\,a_2\,a_3\,m_3\cos(\theta_2)\cos(\theta_3) -$$
$$a_2\,a_3\,m_4\cos(\theta_2)\cos(\theta_3) - a_2\,a_3\,m_5\cos(\theta_2)\cos(\theta_3) - 0.5\,a_4\,a_5\,m_5\cos(\theta_2)\cos(\theta_5) + I_{xz,5}\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) -$$
$$a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3) + a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4) - a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_5) + 0.5\,a_3\,a_4\,m_4\cos(\theta_2)\sin(\theta_4) +$$
$$a_3\,a_4\,m_5\cos(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)\sin(\theta_3) - 0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\sin(\theta_4) -$$
$$a_3\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_3)\sin(\theta_2) - a_3\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_3)\sin(\theta_2) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\sin(\theta_5) - \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) +$$
$$\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\sin(\theta_2)\sin(\theta_3) + 2.0\,I_{xx,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{xx,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) +$$
$$2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) +$$
$$2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) + 2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{xx,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) -$$
$$2.0\,I_{yy,4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,I_{yy,4}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) -$$
$$2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,I_{yy,5}\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - a_3\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)\cos(\theta_3)^2 +$$
$$a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)^2 + a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)^2 + a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_3)^2 + a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)^2 +$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)^2 - 2.0\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)\cos(\theta_3)^2 + 2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)^2 + 2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)^2 +$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_3)^2 + 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)^2 + 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)^2 - 0.5\,a_2\,a_4\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) -$$
$$a_2\,a_4\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) +$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5) - a_3\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) +$$
$$a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) + a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) + a_4\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) -$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_5) -$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_4) - a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) +$$

$a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,a_2\,a_4\,m_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,a_4\,m_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$
$0.5\,a_3\,a_5\,m_5\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$
$a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+$
$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,{a_4}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$
$0.5\,{a_4}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{a_4}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-2.0\,{a_4}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$
$0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$
$0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$
$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$
$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$
$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$
$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)+$
$a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)-2.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)+$
$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)-a_3\,a_4\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-2.0\,a_3\,a_4\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-$
$2.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_5)-$
$4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$
$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2-$
$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2-$
$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,I_{\mathrm{xy},4}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$
$4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$
$2.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-$
$a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$
$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-$
$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$
$8.0\,I_{\mathrm{xy},5}\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)\,-\,0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)\,-$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)-2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)-$
$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$
$2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-$

$$
\begin{aligned}
&2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - \\
&2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5) + 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5) + \\
&{a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3) + {a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + {a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + \\
&4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) + 4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - \\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) + 4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) - \\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) - \\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5) - 4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5) + 4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5) + \\
&a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - a_3\,a_4\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3) - 2.0\,a_3\,a_4\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3) + \\
&0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - \\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3) + \\
&4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4) + 2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5) + \\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5) + \\
&4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) + \\
&4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + \\
&4.0\,I_{\mathrm{xx},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 4.0\,I_{\mathrm{yy},5}\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + \\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) + a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + \\
&a_3\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + 2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) + \\
&2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + \\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) + 2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) + \\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) + \\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) + 4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) + \\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) - 4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4) - \\
&4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) - 4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) - \\
&8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4) - 8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) - \\
&8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) - {a_5}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - \\
&4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + \\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + 4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - \\
&4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)
\end{aligned}
\tag{A7}
$$

$$M_{22} = I_{xx,4} + I_{xx,5} + I_{yy,2} + I_{yy,3} + 0.25\,{a_2}^2\,m_2 + {a_2}^2\,m_3 + {a_2}^2\,m_4 + 0.25\,{a_3}^2\,m_3 + {a_2}^2\,m_5 + {a_3}^2\,m_4 + {a_3}^2\,m_5 +$$
$${lc_{2,1}}^2\,m_2 + {lc_{2,3}}^2\,m_2 + {lc_{3,1}}^2\,m_3 + {lc_{3,3}}^2\,m_3 + {lc_{4,2}}^2\,m_4 + {lc_{4,3}}^2\,m_4 + {lc_{5,2}}^2\,m_5 + {lc_{5,3}}^2\,m_5 + I_{xx,3}\cos(\theta_3)^2 -$$
$$I_{xx,4}\cos(\theta_3)^2 - I_{xx,4}\cos(\theta_4)^2 - I_{xx,5}\cos(\theta_3)^2 - I_{xx,5}\cos(\theta_4)^2 - I_{xx,5}\cos(\theta_5)^2 - I_{yy,3}\cos(\theta_3)^2 + I_{yy,4}\cos(\theta_3)^2 +$$
$$I_{yy,4}\cos(\theta_4)^2 + I_{yy,5}\cos(\theta_3)^2 + I_{yy,5}\cos(\theta_4)^2 + I_{yy,5}\cos(\theta_5)^2 + 2.0\,I_{xx,4}\cos(\theta_3)^2\cos(\theta_4)^2 + 2.0\,I_{xx,5}\cos(\theta_3)^2\cos(\theta_4)^2 +$$
$$2.0\,I_{xx,5}\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,I_{xx,5}\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,I_{yy,4}\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,I_{yy,5}\cos(\theta_3)^2\cos(\theta_4)^2 -$$
$$2.0\,I_{yy,5}\cos(\theta_3)^2\cos(\theta_5)^2 - 2.0\,I_{yy,5}\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,I_{xy,3}\cos(\theta_3)\sin(\theta_3) + 2.0\,I_{xy,4}\cos(\theta_3)\sin(\theta_3) +$$
$$2.0\,I_{xy,5}\cos(\theta_3)\sin(\theta_3) + 2.0\,I_{xy,4}\cos(\theta_4)\sin(\theta_4) + 2.0\,I_{xy,5}\cos(\theta_4)\sin(\theta_4) + 2.0\,I_{xy,5}\cos(\theta_5)\sin(\theta_5) + a_2\,lc_{2,1}\,m_2 +$$
$$a_3\,lc_{3,1}\,m_3 - 0.25\,{a_3}^2\,m_3\cos(\theta_3)^2 - {a_3}^2\,m_4\cos(\theta_3)^2 - {a_3}^2\,m_5\cos(\theta_3)^2 + 0.25\,{a_4}^2\,m_4\cos(\theta_3)^2 + 0.25\,{a_4}^2\,m_4\cos(\theta_4)^2 +$$
$${a_4}^2\,m_5\cos(\theta_3)^2 + {a_4}^2\,m_5\cos(\theta_4)^2 + 0.25\,{a_5}^2\,m_5\cos(\theta_3)^2 + 0.25\,{a_5}^2\,m_5\cos(\theta_4)^2 + 0.25\,{a_5}^2\,m_5\cos(\theta_5)^2 - {lc_{3,1}}^2\,m_3\cos(\theta_3)^2 +$$
$${lc_{3,2}}^2\,m_3\cos(\theta_3)^2 + {lc_{4,1}}^2\,m_4\cos(\theta_3)^2 + {lc_{4,1}}^2\,m_4\cos(\theta_4)^2 - {lc_{4,2}}^2\,m_4\cos(\theta_3)^2 - {lc_{4,2}}^2\,m_4\cos(\theta_4)^2 + {lc_{5,1}}^2\,m_5\cos(\theta_3)^2 +$$
$${lc_{5,1}}^2\,m_5\cos(\theta_4)^2 - {lc_{5,2}}^2\,m_5\cos(\theta_3)^2 + {lc_{5,1}}^2\,m_5\cos(\theta_5)^2 - {lc_{5,2}}^2\,m_5\cos(\theta_4)^2 - {lc_{5,2}}^2\,m_5\cos(\theta_5)^2 - 2.0\,{lc_{4,1}}^2\,m_4\cos(\theta_3)^2\cos(\theta_4)^2 +$$
$$2.0\,{lc_{4,2}}^2\,m_4\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,{lc_{5,1}}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,{lc_{5,1}}^2\,m_5\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,{lc_{5,2}}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2 -$$
$$2.0\,{lc_{5,1}}^2\,m_5\cos(\theta_4)^2\cos(\theta_5)^2 + 2.0\,{lc_{5,2}}^2\,m_5\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,{lc_{5,2}}^2\,m_5\cos(\theta_4)^2\cos(\theta_5)^2 - 4.0\,I_{xx,5}\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 +$$
$$4.0\,I_{yy,5}\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 + a_3\,a_4\,m_4\cos(\theta_4) + 2.0\,a_3\,a_4\,m_5\cos(\theta_4) + 2.0\,a_2\,lc_{3,2}\,m_3\cos(\theta_3) + 2.0\,a_3\,lc_{4,1}\,m_4\cos(\theta_4) +$$
$$a_2\,a_3\,m_3\sin(\theta_3) + 2.0\,a_2\,a_3\,m_4\sin(\theta_3) + 2.0\,a_2\,a_3\,m_5\sin(\theta_3) + 2.0\,a_2\,lc_{3,1}\,m_3\sin(\theta_3) - 2.0\,a_3\,lc_{4,2}\,m_4\sin(\theta_4) -$$
$$4.0\,I_{xy,4}\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 4.0\,I_{xy,4}\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 4.0\,I_{xy,5}\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 4.0\,I_{xy,5}\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) -$$
$$4.0\,I_{xy,5}\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 4.0\,I_{xy,5}\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) - 4.0\,I_{xy,5}\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 4.0\,I_{xy,5}\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) -$$
$$a_3\,lc_{3,1}\,m_3\cos(\theta_3)^2 + a_4\,lc_{4,1}\,m_4\cos(\theta_3)^2 + a_4\,lc_{4,1}\,m_4\cos(\theta_4)^2 + a_5\,lc_{5,1}\,m_5\cos(\theta_3)^2 + a_5\,lc_{5,1}\,m_5\cos(\theta_4)^2 +$$
$$a_5\,lc_{5,1}\,m_5\cos(\theta_5)^2 - 0.5\,{a_4}^2\,m_4\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,{a_4}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2 - 0.5\,{a_5}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2 -$$
$$0.5\,{a_5}^2\,m_5\cos(\theta_3)^2\cos(\theta_5)^2 - 0.5\,{a_5}^2\,m_5\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,a_4\,lc_{4,1}\,m_4\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,a_5\,lc_{5,1}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2 -$$
$$2.0\,a_5\,lc_{5,1}\,m_5\cos(\theta_3)^2\cos(\theta_5)^2 - 2.0\,a_5\,lc_{5,1}\,m_5\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,I_{xx,4}\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) -$$
$$2.0\,I_{xx,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) - 2.0\,I_{xx,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5) - 2.0\,I_{xx,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5) +$$
$$2.0\,I_{yy,4}\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) + 2.0\,I_{yy,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) + 2.0\,I_{yy,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5) +$$
$$2.0\,I_{yy,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5) + {a_5}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 4.0\,{lc_{5,1}}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$4.0\,{lc_{5,2}}^2\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 2.0\,a_2\,lc_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4) - 2.0\,a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) + a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_4) +$$
$$a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_3) + 2.0\,a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_4) + 2.0\,a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_3) - a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) -$$
$$a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) + a_3\,lc_{3,2}\,m_3\cos(\theta_3)\sin(\theta_3) + 2.0\,a_2\,lc_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4) + 2.0\,a_2\,lc_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3) -$$
$$a_4\,lc_{4,2}\,m_4\cos(\theta_3)\sin(\theta_3) - a_4\,lc_{4,2}\,m_4\cos(\theta_4)\sin(\theta_4) - 2.0\,a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - 2.0\,a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) -$$
$$a_5\,lc_{5,2}\,m_5\cos(\theta_3)\sin(\theta_3) - a_5\,lc_{5,2}\,m_5\cos(\theta_4)\sin(\theta_4) - a_5\,lc_{5,2}\,m_5\cos(\theta_5)\sin(\theta_5) + 2.0\,lc_{3,1}\,lc_{3,2}\,m_3\cos(\theta_3)\sin(\theta_3) -$$
$$2.0\,lc_{4,1}\,lc_{4,2}\,m_4\cos(\theta_3)\sin(\theta_3) - 2.0\,lc_{4,1}\,lc_{4,2}\,m_4\cos(\theta_4)\sin(\theta_4) - 2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_3)\sin(\theta_3) - 2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_4)\sin(\theta_4) -$$
$$2.0\,lc_{5,1}\,lc_{5,2}\,m_5\cos(\theta_5)\sin(\theta_5) - 2.0\,a_2\,lc_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4) + 2.0\,a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) - a_3\,a_4\,m_4\cos(\theta_3)^2\cos(\theta_4) -$$
$$2.0\,a_3\,a_4\,m_5\cos(\theta_3)^2\cos(\theta_4) - 2.0\,a_3\,lc_{4,1}\,m_4\cos(\theta_3)^2\cos(\theta_4) - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_3)^2\cos(\theta_5) - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_4)^2\cos(\theta_5) -$$
$$a_4\,a_5\,m_5\cos(\theta_3)^2\sin(\theta_5) - a_4\,a_5\,m_5\cos(\theta_4)^2\sin(\theta_5) + 2.0\,a_3\,lc_{4,2}\,m_4\cos(\theta_3)^2\sin(\theta_4) - 2.0\,a_4\,lc_{5,1}\,m_5\cos(\theta_3)^2\sin(\theta_5) -$$
$$2.0\,a_4\,lc_{5,1}\,m_5\cos(\theta_4)^2\sin(\theta_5) + 8.0\,I_{xy,5}\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3) + 8.0\,I_{xy,5}\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$8.0\,I_{xy,5}\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,{a_4}^2\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) + 2.0\,{a_4}^2\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) +$$
$$0.5\,{a_5}^2\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) + 0.5\,{a_5}^2\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5) + 0.5\,{a_5}^2\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5) +$$

$$
\begin{aligned}
&a_2\,a_5\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-a_4\,a_5\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)-a_4\,a_5\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+\\
&2.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)-2.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-2.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\\
&2.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+\\
&a_3\,a_4\,m_4\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,a_3\,a_4\,m_5\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,a_5\,m_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,a_5\,m_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&a_2\,a_5\,m_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&2.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&4.0\,I_{\mathrm{xx},5}\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+4.0\,I_{\mathrm{xx},5}\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,I_{\mathrm{xx},5}\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,I_{\mathrm{yy},5}\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,I_{\mathrm{yy},5}\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,I_{\mathrm{yy},5}\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)+a_3\,a_5\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+a_3\,a_5\,m_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)+\\
&2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+\\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+\\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-\\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+2.0\,a_4\,a_5\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+\\
&4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,a_5\,m_5\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-{a_5}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-{a_5}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&{a_5}^2\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+\\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)+2.0\,a_4\,a_5\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)+\\
&4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-\\
&8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-\\
&8.0\,I_{\mathrm{xy},5}\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_3\,a_5\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&2.0\,a_4\,a_5\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)
\end{aligned}
\tag{A8}
$$

$$M_{23} = I_{yz,3}\sin(\theta_3) - I_{xz,3}\cos(\theta_3) - I_{xz,4}\cos(\theta_3)\cos(\theta_4) + I_{yz,4}\cos(\theta_3)\sin(\theta_4) + I_{yz,4}\cos(\theta_4)\sin(\theta_3) + I_{xz,4}\sin(\theta_3)\sin(\theta_4) + I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_3\,lc_{3,3}\,m_3\cos(\theta_3) + a_3\,lc_{4,3}\,m_4\cos(\theta_3) + a_3\,lc_{5,3}\,m_5\cos(\theta_3) + lc_{3,1}\,lc_{3,3}\,m_3\cos(\theta_3) - lc_{3,2}\,lc_{3,3}\,m_3\sin(\theta_3) + 0.5\,a_4\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) + a_4\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4) + lc_{4,1}\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_3)\sin(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_4)\sin(\theta_3) - 0.5\,a_4\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - a_4\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4) - lc_{4,1}\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \tag{A9}$$

$$M_{24} = I_{yz,4}\cos(\theta_3)\sin(\theta_4) - I_{xz,4}\cos(\theta_3)\cos(\theta_4) + I_{yz,4}\cos(\theta_4)\sin(\theta_3) + I_{xz,4}\sin(\theta_3)\sin(\theta_4) + I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_4\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) + a_4\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4) + lc_{4,1}\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_3)\sin(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_4)\sin(\theta_3) - 0.5\,a_4\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - a_4\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4) - lc_{4,1}\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \tag{A10}$$

$$M_{25} = I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \tag{A11}$$

$$
\begin{aligned}
M_{31} = {} & I_{\mathrm{yz},4}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) - I_{\mathrm{zz},4}\sin(\theta_2) - I_{\mathrm{zz},5}\sin(\theta_2) - I_{\mathrm{yz},3}\cos(\theta_2)\cos(\theta_3) - I_{\mathrm{xz},3}\cos(\theta_2)\sin(\theta_3) - \\
& 0.25\,{a_3}^2\,m_3\sin(\theta_2) - {a_3}^2\,m_4\sin(\theta_2) - {a_3}^2\,m_5\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\sin(\theta_2) - {a_4}^2\,m_5\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\sin(\theta_2) - \\
& {\mathrm{lc}_{3,1}}^2\,m_3\sin(\theta_2) - {\mathrm{lc}_{3,2}}^2\,m_3\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{4,2}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{5,1}}^2\,m_5\sin(\theta_2) - {\mathrm{lc}_{5,2}}^2\,m_5\sin(\theta_2) - \\
& I_{\mathrm{yz},4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) - I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - I_{\mathrm{zz},3}\sin(\theta_2) + a_1\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3) + \\
& 0.5\,a_1\,a_3\,m_3\sin(\theta_3) + a_1\,a_3\,m_4\sin(\theta_3) + a_1\,a_3\,m_5\sin(\theta_3) + a_1\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_3) - a_3\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_2) - a_4\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_2) - \\
& a_5\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2) - I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_3)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_4)\sin(\theta_2) + \\
& a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_5)\sin(\theta_2) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + \\
& I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - \\
& I_{\mathrm{yz},5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.25\,a_2\,a_3\,m_3\cos(\theta_2)\cos(\theta_3) + 0.5\,a_2\,a_3\,m_4\cos(\theta_2)\cos(\theta_3) + 0.5\,a_2\,a_3\,m_5\cos(\theta_2)\cos(\theta_3) + \\
& 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_2)\cos(\theta_3) + a_1\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4) - a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_2)\cos(\theta_4) - a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_2)\cos(\theta_5) + \\
& 0.5\,a_1\,a_4\,m_4\cos(\theta_3)\sin(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_4)\sin(\theta_3) + a_1\,a_4\,m_5\cos(\theta_3)\sin(\theta_4) + a_1\,a_4\,m_5\cos(\theta_4)\sin(\theta_3) - \\
& 0.5\,a_3\,a_4\,m_4\cos(\theta_2)\sin(\theta_4) - 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) - a_3\,a_4\,m_5\cos(\theta_2)\sin(\theta_4) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + \\
& \mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\cos(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_2)\sin(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_3) + \\
& 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_2)\sin(\theta_4) - \\
& a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3) + a_3\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_2)\sin(\theta_5) + \\
& a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) - 0.25\,a_2\,a_3\,m_3\sin(\theta_2)\sin(\theta_3) - 0.5\,a_2\,a_3\,m_4\sin(\theta_2)\sin(\theta_3) - 0.5\,a_2\,a_3\,m_5\sin(\theta_2)\sin(\theta_3) + \\
& a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) + \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_2)\sin(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4) + \\
& a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) - 0.25\,a_2\,a_3\,m_3\cos(\theta_3)\cos(\theta_2) - 0.5\,a_2\,a_3\,m_4\cos(\theta_3)\cos(\theta_2) - \\
& 0.5\,a_2\,a_3\,m_5\cos(\theta_3)\cos(\theta_2) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\cos(\theta_3)\cos(\theta_2) + a_3\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_4)\cos(\theta_2) + a_4\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\cos(\theta_2) - \\
& 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) + 0.5\,a_3\,a_4\,m_4\sin(\theta_4)\cos(\theta_2) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + a_3\,a_4\,m_5\sin(\theta_4)\cos(\theta_2) - \\
& 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\sin(\theta_3)\cos(\theta_2) - 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\cos(\theta_3)\sin(\theta_2) + 0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\sin(\theta_3)\cos(\theta_2) - \\
& a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + a_3\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_4)\cos(\theta_2) + a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) - a_4\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_5)\cos(\theta_2) - \\
& 0.25\,a_2\,a_3\,m_3\sin(\theta_3)\sin(\theta_2) - 0.5\,a_2\,a_3\,m_4\sin(\theta_3)\sin(\theta_2) - 0.5\,a_2\,a_3\,m_5\sin(\theta_3)\sin(\theta_2) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + \\
& a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + \\
& 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \\
& a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + 2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) + \\
& a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - 0.5\,a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - \\
& 0.5\,a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \\
& 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + \\
& \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - \\
& a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + \\
& 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 2.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) + \\
& a_2\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - 2.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \\
& \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \\
& \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + \\
& a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \\
& 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \\
& 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \\
& \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \\
& a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - \\
& a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)
\end{aligned}
\tag{A12}
$$

$$M_{32} = I_{yz,3}\sin(\theta_3) - I_{xz,3}\cos(\theta_3) - I_{xz,4}\cos(\theta_3)\cos(\theta_4) + I_{yz,4}\cos(\theta_3)\sin(\theta_4) + I_{yz,4}\cos(\theta_4)\sin(\theta_3) + I_{xz,4}\sin(\theta_3)\sin(\theta_4) + I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_3\,lc_{3,3}\,m_3\cos(\theta_3) + a_3\,lc_{4,3}\,m_4\cos(\theta_3) + a_3\,lc_{5,3}\,m_5\cos(\theta_3) + lc_{3,1}\,lc_{3,3}\,m_3\cos(\theta_3) - lc_{3,2}\,lc_{3,3}\,m_3\sin(\theta_3) + 0.5\,a_4\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) + a_4\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4) + lc_{4,1}\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_3)\sin(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_4)\sin(\theta_3) - 0.5\,a_4\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - a_4\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4) - lc_{4,1}\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \quad \text{(A13)}$$

$$M_{33} = I_{zz,3} + I_{zz,4} + I_{zz,5} + 0.25\,{a_3}^2\,m_3 + {a_3}^2\,m_4 + {a_3}^2\,m_5 + 0.25\,{a_4}^2\,m_4 + {a_4}^2\,m_5 + 0.25\,{a_5}^2\,m_5 + {lc_{3,1}}^2\,m_3 + {lc_{3,2}}^2\,m_3 + {lc_{4,1}}^2\,m_4 + {lc_{4,2}}^2\,m_4 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_3\,lc_{3,1}\,m_3 + a_4\,lc_{4,1}\,m_4 + a_5\,lc_{5,1}\,m_5 + a_3\,a_4\,m_4\cos(\theta_4) + 2.0\,a_3\,a_4\,m_5\cos(\theta_4) + 2.0\,a_3\,lc_{4,1}\,m_4\cos(\theta_4) - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_5) - a_4\,a_5\,m_5\sin(\theta_5) - 2.0\,a_3\,lc_{4,2}\,m_4\sin(\theta_4) - 2.0\,a_4\,lc_{5,1}\,m_5\sin(\theta_5) - 2.0\,a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) - a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) - a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) - 2.0\,a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - 2.0\,a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) + 2.0\,a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) \quad \text{(A14)}$$

$$M_{34} = I_{zz,4} + I_{zz,5} + 0.25\,{a_4}^2\,m_4 + {a_4}^2\,m_5 + 0.25\,{a_5}^2\,m_5 + {lc_{4,1}}^2\,m_4 + {lc_{4,2}}^2\,m_4 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_4\,lc_{4,1}\,m_4 + a_5\,lc_{5,1}\,m_5 + 0.5\,a_3\,a_4\,m_4\cos(\theta_4) + a_3\,a_4\,m_5\cos(\theta_4) + a_3\,lc_{4,1}\,m_4\cos(\theta_4) - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_5) - a_4\,a_5\,m_5\sin(\theta_5) - a_3\,lc_{4,2}\,m_4\sin(\theta_4) - 2.0\,a_4\,lc_{5,1}\,m_5\sin(\theta_5) - a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) - a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) + a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) \quad \text{(A15)}$$

$$M_{35} = I_{zz,5} + 0.25\,{a_5}^2\,m_5 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_5\,lc_{5,1}\,m_5 - a_4\,lc_{5,2}\,m_5\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\sin(\theta_5) - a_4\,lc_{5,1}\,m_5\sin(\theta_5) - a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) - a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) + a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) \quad \text{(A16)}$$

$$M_{41} = I_{\mathrm{yz},4}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) - I_{\mathrm{zz},5}\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\sin(\theta_2) - {a_4}^2\,m_5\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{4,2}}^2\,m_4\sin(\theta_2) - {\mathrm{lc}_{5,1}}^2\,m_5\sin(\theta_2) - {\mathrm{lc}_{5,2}}^2\,m_5\sin(\theta_2) - I_{\mathrm{yz},4}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) - I_{\mathrm{xz},4}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - I_{\mathrm{zz},4}\sin(\theta_2) - a_4\,\mathrm{lc}_{4,1}\,m_4\sin(\theta_2) - a_5\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2) - I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{\mathrm{yz},5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{\mathrm{xz},5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{\mathrm{yz},5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + a_1\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_3)\sin(\theta_4) + 0.5\,a_1\,a_4\,m_4\cos(\theta_4)\sin(\theta_3) + a_1\,a_4\,m_5\cos(\theta_3)\sin(\theta_4) + a_1\,a_4\,m_5\cos(\theta_4)\sin(\theta_3) - 0.5\,a_3\,a_4\,m_4\cos(\theta_4)\sin(\theta_2) - a_3\,a_4\,m_5\cos(\theta_4)\sin(\theta_2) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_3) - a_3\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2) + 2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) + a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) - a_1\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_4) + 2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\cos(\theta_4) - a_2\,\mathrm{lc}_{4,2}\,m_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_3\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + a_4\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - 0.5\,a_2\,a_4\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - 0.5\,a_2\,a_4\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_2\,a_4\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,a_4\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_3)\sin(\theta_4) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\cos(\theta_4)\sin(\theta_3) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - a_2\,\mathrm{lc}_{4,1}\,m_4\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - \mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\cos(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{4,2}\,m_4\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + a_1\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_3\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,\mathrm{lc}_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_2\,\mathrm{lc}_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) \tag{A17}$$

$$M_{42} = I_{yz,4}\cos(\theta_3)\sin(\theta_4) - I_{xz,4}\cos(\theta_3)\cos(\theta_4) + I_{yz,4}\cos(\theta_4)\sin(\theta_3) + I_{xz,4}\sin(\theta_3)\sin(\theta_4) + I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_4\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) + a_4\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4) + lc_{4,1}\,lc_{4,3}\,m_4\cos(\theta_3)\cos(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_3)\sin(\theta_4) - lc_{4,2}\,lc_{4,3}\,m_4\cos(\theta_4)\sin(\theta_3) - 0.5\,a_4\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - a_4\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4) - lc_{4,1}\,lc_{4,3}\,m_4\sin(\theta_3)\sin(\theta_4) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \quad \text{(A18)}$$

$$M_{43} = I_{zz,4} + I_{zz,5} + 0.25\,{a_4}^2\,m_4 + {a_4}^2\,m_5 + 0.25\,{a_5}^2\,m_5 + {lc_{4,1}}^2\,m_4 + {lc_{4,2}}^2\,m_4 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_4\,lc_{4,1}\,m_4 + a_5\,lc_{5,1}\,m_5 + 0.5\,a_3\,a_4\,m_4\cos(\theta_4) + a_3\,a_4\,m_5\cos(\theta_4) + a_3\,lc_{4,1}\,m_4\cos(\theta_4) - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_5) - a_4\,a_5\,m_5\sin(\theta_5) - a_3\,lc_{4,2}\,m_4\sin(\theta_4) - 2.0\,a_4\,lc_{5,1}\,m_5\sin(\theta_5) - a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) - a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) + a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) \quad \text{(A19)}$$

$$M_{44} = I_{zz,4} + I_{zz,5} + 0.25\,{a_4}^2\,m_4 + {a_4}^2\,m_5 + 0.25\,{a_5}^2\,m_5 + {lc_{4,1}}^2\,m_4 + {lc_{4,2}}^2\,m_4 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_4\,lc_{4,1}\,m_4 + a_5\,lc_{5,1}\,m_5 - 2.0\,a_4\,lc_{5,2}\,m_5\cos(\theta_5) - a_4\,a_5\,m_5\sin(\theta_5) - 2.0\,a_4\,lc_{5,1}\,m_5\sin(\theta_5) \quad \text{(A20)}$$

$$M_{45} = 0.25\,m_5\,{a_5}^2 + m_5\,a_5\,lc_{5,1} - 0.5\,a_4\,m_5\sin(\theta_5)\,a_5 + m_5\,{lc_{5,1}}^2 - a_4\,m_5\sin(\theta_5)\,lc_{5,1} + m_5\,{lc_{5,2}}^2 - a_4\,m_5\cos(\theta_5)\,lc_{5,2} + I_{zz,5} \quad \text{(A21)}$$

$$M_{51} = I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.25\,{a_5}^2\,m_5\sin(\theta_2) - {lc_{5,1}}^2\,m_5\sin(\theta_2) - {lc_{5,2}}^2\,m_5\sin(\theta_2) - a_5\,lc_{5,1}\,m_5\sin(\theta_2) - I_{xz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - I_{zz,5}\sin(\theta_2) + I_{yz,5}\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{yz,5}\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + I_{xz,5}\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + I_{xz,5}\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{yz,5}\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + a_4\,lc_{5,2}\,m_5\cos(\theta_5)\sin(\theta_2) + 0.5\,a_4\,a_5\,m_5\sin(\theta_2)\sin(\theta_5) + a_4\,lc_{5,1}\,m_5\sin(\theta_2)\sin(\theta_5) + 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + a_1\,lc_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_1\,lc_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - a_1\,lc_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - a_1\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - 0.5\,a_1\,a_5\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_1\,a_5\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) - a_1\,lc_{5,1}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_1\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - a_1\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_1\,lc_{5,2}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_3\,lc_{5,2}\,m_5\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - a_2\,lc_{5,1}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + a_2\,lc_{5,2}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + a_2\,lc_{5,2}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + a_2\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + a_2\,lc_{5,1}\,m_5\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5) + a_2\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5) + a_2\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - a_2\,lc_{5,2}\,m_5\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) \tag{A22}$$

$$M_{52} = I_{yz,5}\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) + I_{xz,5}\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) + I_{xz,5}\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{yz,5}\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{yz,5}\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - 0.5\,a_5\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - lc_{5,1}\,lc_{5,3}\,m_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) + lc_{5,2}\,lc_{5,3}\,m_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) + 0.5\,a_5\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + lc_{5,1}\,lc_{5,3}\,m_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) \tag{A23}$$

$$M_{53} = I_{zz,5} + 0.25\,{a_5}^2\,m_5 + {lc_{5,1}}^2\,m_5 + {lc_{5,2}}^2\,m_5 + a_5\,lc_{5,1}\,m_5 - a_4\,lc_{5,2}\,m_5\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\sin(\theta_5) - a_4\,lc_{5,1}\,m_5\sin(\theta_5) - a_3\,lc_{5,2}\,m_5\cos(\theta_4)\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_4)\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\cos(\theta_5)\sin(\theta_4) - a_3\,lc_{5,1}\,m_5\cos(\theta_4)\sin(\theta_5) - a_3\,lc_{5,1}\,m_5\cos(\theta_5)\sin(\theta_4) + a_3\,lc_{5,2}\,m_5\sin(\theta_4)\sin(\theta_5) \tag{A24}$$

$$M_{54} = 0.25\,m_5\,{a_5}^2 + m_5\,a_5\,lc_{5,1} - 0.5\,a_4\,m_5\sin(\theta_5)\,a_5 + m_5\,{lc_{5,1}}^2 - a_4\,m_5\sin(\theta_5)\,lc_{5,1} + m_5\,{lc_{5,2}}^2 - a_4\,m_5\cos(\theta_5)\,lc_{5,2} + I_{zz,5} \tag{A25}$$

$$M_{55} = 0.25\,m_5\,{a_5}^2 + m_5\,a_5\,lc_{5,1} + m_5\,{lc_{5,1}}^2 + m_5\,{lc_{5,2}}^2 + I_{zz,5} \tag{A26}$$

In the context of the coupled human-exoskeleton system, m_i represents the mass, a_i denotes the length, and $I_{xx,i}, I_{yy,i}, I_{zz,i}$ are the moments of inertia for the i^{th} link. Additionally, $I_{xy,i}, I_{xz,i}, I_{yz,i}$ refer to the products of inertia. The coordinates $l_{ci,x}, l_{ci,y}, l_{ci,z}$ specify the center of mass along the x, y, and z axes, respectively, while θ_i signifies the angular position.

B. CORIOLIS AND CENTRIPETAL MATRIX ($C(q, \dot{q})$)

Regarding the Coriolis and centripetal matrix, the following formulations are derived:

$$C(q,\dot{q}) = \begin{bmatrix} C_{11} & C_{12} & C_{13} & C_{14} & C_{15} \\ C_{21} & C_{22} & C_{23} & C_{24} & C_{25} \\ C_{31} & C_{32} & C_{33} & C_{34} & C_{35} \\ C_{41} & C_{42} & C_{43} & C_{44} & C_{45} \\ C_{51} & C_{52} & C_{53} & C_{54} & C_{55} \end{bmatrix} \tag{A27}$$

where

$$
\begin{aligned}
C_{11} \;=\; & 0.25\,I_{\mathrm{xy},3}\,\dot{\theta}_2 + 0.25\,I_{\mathrm{xy},3}\,\dot{\theta}_3 - 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_2 + 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_3 - 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_2 + 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_4 + 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_3 + \\
& 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_4 + 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_5 - 0.5\,I_{\mathrm{xy},3}\,\dot{\theta}_2\cos(\theta_2)^2 - 0.5\,I_{\mathrm{xy},3}\,\dot{\theta}_2\cos(\theta_3)^2 - 0.5\,I_{\mathrm{xy},3}\,\dot{\theta}_3\cos(\theta_2)^2 + 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\cos(\theta_2)^2 - \\
& 0.5\,I_{\mathrm{xy},3}\,\dot{\theta}_3\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\cos(\theta_2)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_2)^2 + 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\cos(\theta_4)^2 - \\
& 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\cos(\theta_2)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_2)^2 - 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\cos(\theta_4)^2 - \\
& 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_4)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_2)^2 - 0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\cos(\theta_4)^2 + \\
& 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_5)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_4)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_3)^2 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_2)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_5)^2 - \\
& 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_4)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_3)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_5)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_4)^2 + \\
& I_{\mathrm{xz},2}\,\dot{\theta}_2\cos(2.0\,\theta_2) + 0.25\,I_{\mathrm{xy},3}\,\dot{\theta}_2\cos(2.0\,\theta_3) + 0.25\,I_{\mathrm{xy},3}\,\dot{\theta}_3\cos(2.0\,\theta_3) - 0.5\,I_{\mathrm{xx},2}\,\dot{\theta}_2\sin(2.0\,\theta_2) - 0.25\,I_{\mathrm{xx},3}\,\dot{\theta}_2\sin(2.0\,\theta_2) + \\
& 0.125\,I_{\mathrm{xx},3}\,\dot{\theta}_2\sin(2.0\,\theta_3) - 0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_2\sin(2.0\,\theta_2) + 0.125\,I_{\mathrm{xx},3}\,\dot{\theta}_3\sin(2.0\,\theta_3) - 0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_2\sin(2.0\,\theta_2) - 0.25\,I_{\mathrm{yy},3}\,\dot{\theta}_2\sin(2.0\,\theta_2) - \\
& 0.125\,I_{\mathrm{yy},3}\,\dot{\theta}_2\sin(2.0\,\theta_3) - 0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_2\sin(2.0\,\theta_2) - 0.125\,I_{\mathrm{yy},3}\,\dot{\theta}_3\sin(2.0\,\theta_3) - 0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_2\sin(2.0\,\theta_2) + 0.5\,I_{\mathrm{zz},2}\,\dot{\theta}_2\sin(2.0\,\theta_2) + \\
& 0.5\,I_{\mathrm{zz},3}\,\dot{\theta}_2\sin(2.0\,\theta_2) + 0.5\,I_{\mathrm{zz},4}\,\dot{\theta}_2\sin(2.0\,\theta_2) + 0.5\,I_{\mathrm{zz},5}\,\dot{\theta}_2\sin(2.0\,\theta_2) + 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4) - 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_3\cos(2.0\,\theta_3)\cos(2.0\,\theta_4) - \\
& 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_4\cos(2.0\,\theta_3)\cos(2.0\,\theta_4) + 0.5\,I_{\mathrm{yz},3}\,\dot{\theta}_2\cos(2.0\,\theta_2)\cos(\theta_3) - 0.25\,I_{\mathrm{yz},3}\,\dot{\theta}_3\cos(2.0\,\theta_2)\cos(\theta_3) - 0.125\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2 - \\
& 0.125\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3 + 0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2 - 0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3 - 0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4 + 0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 - 0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3 - \\
& 0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4 - 0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5 - 0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2 - 0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3 + 0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2 - 0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3 - \\
& 0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4 + 0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 - 0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3 - 0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4 - 0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5 + \\
& 0.5\,I_{\mathrm{xz},3}\,\dot{\theta}_2\cos(2.0\,\theta_2)\sin(\theta_3) - 0.5\,I_{\mathrm{xz},3}\,\dot{\theta}_2\cos(\theta_3)\sin(2.0\,\theta_2) - 0.25\,I_{\mathrm{xz},3}\,\dot{\theta}_3\cos(2.0\,\theta_2)\sin(\theta_3) + 0.25\,I_{\mathrm{xz},3}\,\dot{\theta}_3\cos(\theta_3)\sin(2.0\,\theta_2) + \\
& 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) + 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) - 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_3\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) - \\
& 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_3\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) - 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_4\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) - 0.125\,I_{\mathrm{xx},4}\,\dot{\theta}_4\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) - \\
& 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) - 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) + 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_3\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) + \\
& 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_3\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) + 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_4\cos(2.0\,\theta_3)\sin(2.0\,\theta_4) + 0.125\,I_{\mathrm{yy},4}\,\dot{\theta}_4\cos(2.0\,\theta_4)\sin(2.0\,\theta_3) - \\
& 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_2\sin(2.0\,\theta_3)\sin(2.0\,\theta_4) + 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_3\sin(2.0\,\theta_3)\sin(2.0\,\theta_4) + 0.25\,I_{\mathrm{xy},4}\,\dot{\theta}_4\sin(2.0\,\theta_3)\sin(2.0\,\theta_4) + 0.5\,I_{\mathrm{yz},3}\,\dot{\theta}_2\sin(2.0\,\theta_2)\sin(\theta_3) - \\
\end{aligned}
$$

$$0.25\,I_{yz,3}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,I_{yz,3}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+0.25\,I_{yz,3}\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+0.5\,I_{xz,3}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{xz,3}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+0.25\,I_{xz,3}\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.25\,I_{xz,3}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+0.125\,{a_2}^2\,m_2\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+$$
$$0.5\,{a_2}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.5\,{a_2}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.0625\,{a_3}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.5\,{a_2}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.03125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)+$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.03125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)-0.125\,{a_3}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.125\,{a_3}^2\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)-0.125\,{a_3}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-$$
$$0.125\,{a_3}^2\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+I_{xy,3}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2+I_{xy,3}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-$$
$$I_{xy,4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-I_{xy,4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-I_{xy,4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-I_{xy,4}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-$$
$$I_{xy,4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-I_{xy,4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2+I_{xy,4}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-$$
$$I_{xy,4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2+$$
$$I_{xy,4}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2-I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2-$$
$$I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2-I_{xy,5}\,\dot{\theta}_2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2-I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-$$
$$I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2+I_{xy,5}\,\dot{\theta}_3\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2-I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+$$
$$I_{xy,5}\,\dot{\theta}_4\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+I_{xy,5}\,\dot{\theta}_5\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-0.5\,I_{yz,3}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,I_{yz,3}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{2,1}}^2\,m_2\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.5\,{\mathrm{lc}_{2,3}}^2\,m_2\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-$$
$$0.125\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)+0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.125\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)+0.125\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{3,3}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.125\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,3}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-0.5\,{\mathrm{lc}_{5,3}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)-$$
$$0.5\,I_{xy,3}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.5\,I_{xy,3}\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{xx,3}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{xx,3}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,I_{yy,3}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{yy,3}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{xx,3}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{xx,3}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{xx,4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{xx,3}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{xx,5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{xx,3}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{xx,5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{xx,4}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{xx,4}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,I_{xx,4}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{xx,5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{xx,4}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,I_{xx,5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,I_{xx,5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{xx,4}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,I_{xx,5}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,I_{xx,5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{xx,5}\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,I_{xx,5}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,I_{xx,5}\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,I_{xx,5}\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,I_{xx,5}\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,I_{xx,5}\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,I_{yy,3}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{yy,3}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{yy,4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{yy,3}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{yy,5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{yy,3}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{yy,5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{yy,4}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{yy,4}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,I_{yy,4}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{yy,5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{yy,4}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,I_{yy,5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,I_{yy,5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,I_{yy,4}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,I_{yy,5}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,I_{yy,5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,I_{yy,5}\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,I_{yy,5}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,I_{yy,5}\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,I_{yy,5}\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,I_{yy,5}\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,I_{yy,5}\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+$$

$$0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+$$
$$0.5\,I_{\mathrm{xx},3}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xx},3}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{xx},3}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xx},3}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,I_{\mathrm{yy},3}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{yy},3}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,I_{\mathrm{yy},3}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{yy},3}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$

$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)^2\,\sin(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)-0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)^2\,\sin(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2+I_{\mathrm{yz},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+$$
$$0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\cos(\theta_2)^2+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\cos(\theta_3)^2+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\cos(\theta_2)^2+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\cos(\theta_3)^2-$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_2)^2-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_2)^2-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2+$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_2)^2+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_4)^2+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2+$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_4)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_2)^2-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_2)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_5)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_5)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_5)^2+0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\cos(\theta_2)^2+0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\cos(\theta_3)^2+0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\cos(\theta_2)^2+$$
$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\cos(\theta_3)^2-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_2)^2-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_2)^2-$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_2)^2+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_4)^2+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_4)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_2)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_2)^2-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_2)^2+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_5)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_5)^2+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_5)^2-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{xx},3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,I_{\mathrm{xx},3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$I_{\mathrm{xz},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{\mathrm{xz},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+0.5\,I_{\mathrm{xz},4}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+$$

$$0.5\,I_{xz,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-0.25\,I_{yy,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,I_{yy,3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.5\,I_{xy,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.5\,I_{xy,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.5\,I_{xy,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.5\,I_{xy,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+0.5\,I_{xy,3}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)-I_{yz,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,I_{yz,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,I_{yz,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,I_{yz,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,I_{yz,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,I_{xz,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,I_{xz,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.25\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+0.25\,I_{xy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+0.25\,I_{xy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+$$
$$0.25\,I_{xy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)-0.5\,a_2\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_2\,\cos(2.0\,\theta_2)-a_2\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)-0.125\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)-$$
$$0.125\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)-a_2\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)-a_2\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)-\mathrm{lc}_{2,1}\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_2\,\cos(2.0\,\theta_2)-$$
$$0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)-0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)-0.125\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,I_{xx,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,I_{xx,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,I_{xx,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,I_{xx,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,I_{xx,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,I_{xx,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,I_{xx,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,I_{xx,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,I_{xx,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.125\,I_{yy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,I_{yy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,I_{yy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.125\,I_{yy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,I_{yy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,I_{yy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.125\,I_{yy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,I_{yy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,I_{yy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.5\,a_2\,\mathrm{lc}_{2,1}\,m_2\,\dot{\theta}_2\,\sin(2.0\,\theta_2)+$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)-0.125\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)-0.125\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)+0.25\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+$$
$$0.25\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,I_{xy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,I_{xy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{xy,5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,I_{xy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,I_{xy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{xy,5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,I_{xy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,I_{xy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{xy,5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.125\,I_{xx,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,I_{xx,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,I_{xx,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,I_{xx,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,I_{yy,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,I_{yy,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,I_{yy,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,I_{yy,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.0625\,{a_3}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.0625\,{a_3}^2\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,{a_3}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,{a_3}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,{a_3}^2\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.0625\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+0.0625\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+0.0625\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+0.0625\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_2)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_2)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+$$

$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_1\,a_2\,m_2\,\dot{\theta}_2\,\cos\left(\theta_2\right)-a_1\,a_2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)-$$
$$a_1\,a_2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)-a_1\,a_2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)+0.25\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)+0.5\,a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)+0.5\,a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)-$$
$$0.375\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)-a_1\,{\mathrm{lc}_{2,1}}\,m_2\,\dot{\theta}_2\,\cos\left(\theta_2\right)+0.5\,a_2\,{\mathrm{lc}_{3,1}}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)-0.75\,a_3\,{\mathrm{lc}_{4,2}}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)-0.75\,a_4\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)-$$
$$0.375\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)-0.75\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(\theta_4\right)-a_1\,{\mathrm{lc}_{2,3}}\,m_2\,\dot{\theta}_2\,\sin\left(\theta_2\right)-a_1\,{\mathrm{lc}_{3,3}}\,m_3\,\dot{\theta}_2\,\sin\left(\theta_2\right)-0.5\,a_2\,{\mathrm{lc}_{3,2}}\,m_3\,\dot{\theta}_3\,\sin\left(\theta_3\right)-$$
$$a_1\,{\mathrm{lc}_{4,3}}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_2\right)-0.75\,a_3\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)-a_1\,{\mathrm{lc}_{5,3}}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)+0.75\,a_4\,{\mathrm{lc}_{5,2}}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_5\right)-0.03125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.03125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.03125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.03125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$0.125\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.03125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.03125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.125\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+$$
$$0.125\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)+$$
$$0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)-0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)+0.125\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$

$$0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-$$

$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+0.25\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)-0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)+$$
$$0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)+0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+0.25\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+0.125\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$0.125\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(2.0\,\theta_2\right)+0.25\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)+0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+0.25\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)+0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(2.0\,\theta_2\right)+0.25\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$0.125\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_2\,a_3\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_2\,a_3\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_3\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_2\,a_3\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+$$
$$0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(2.0\,\theta_2\right)+I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)+0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.25\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+$$

$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.25\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.0625\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.0625\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},4}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-I_{\mathrm{yy},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-I_{\mathrm{yy},4}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-I_{\mathrm{yy},4}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-$$

$I_{yy,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - I_{yy,4}\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - I_{yy,4}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) -$
$I_{yy,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - I_{yy,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
$I_{yy,4}\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) -$
$I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - I_{yy,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + I_{yy,5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - I_{yy,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) -$
$I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) - I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$I_{yy,5}\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + I_{yy,5}\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + I_{yy,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) + I_{yy,5}\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$I_{yy,5}\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + I_{yy,5}\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + I_{yy,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) + I_{yy,5}\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$I_{yy,5}\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + I_{yy,5}\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + I_{yy,5}\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) +$
$I_{yz,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{yz,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{yz,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) +$
$0.5\,I_{yz,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,I_{yz,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{yz,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) +$
$0.5\,I_{yz,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,I_{yz,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{yz,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) +$
$0.5\,I_{yz,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 0.25\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3) - 0.125\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3) -$
$0.5\,a_2\,a_3\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3) - 0.25\,a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3) - 0.5\,a_2\,a_3\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3) -$
$0.25\,a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3) + 0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_5) + 0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_2)\,\cos(\theta_5) +$
$0.5\,I_{xz,5}\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{xz,5}\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,I_{xz,5}\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$
$0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_2) + 0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_2) - 0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3) - 0.25\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3) +$
$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4) + 0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_4) -$
$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4) + 0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_5) + 0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_2)\,\cos(\theta_5) +$
$0.25\,a_1\,a_3\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2) - 0.25\,a_1\,a_3\,m_3\,\dot{\theta}_2\,\sin(\theta_3)\,\cos(\theta_2) - 0.25\,a_1\,a_3\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2) + 0.25\,a_1\,a_3\,m_3\,\dot{\theta}_3\,\sin(\theta_3)\,\cos(\theta_2) +$
$0.5\,a_1\,a_3\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2) - 0.5\,a_1\,a_3\,m_4\,\dot{\theta}_2\,\sin(\theta_3)\,\cos(\theta_2) - 0.5\,a_1\,a_3\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2) + 0.5\,a_1\,a_3\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\cos(\theta_2) +$
$0.5\,a_1\,a_3\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2) - 0.5\,a_1\,a_3\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\cos(\theta_2) - 0.5\,a_1\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2) + 0.5\,a_1\,a_3\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\cos(\theta_2) +$
$0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_4) + 0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_4) + 0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_4) +$
$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_4) - 0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4) - 0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4) +$
$0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\sin(\theta_4) + 0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_4) - 0.125\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4) -$
$0.125\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4) - 0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4) - 0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4) +$
$0.125\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\sin(\theta_4) + 0.125\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_4) - 0.25\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4) -$
$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4) - 0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\cos(\theta_3) - 0.25\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3) +$

$$0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)-0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(\theta_3)\,\cos(\theta_2)-0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)+0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin(\theta_3)\,\cos(\theta_2)+$$
$$0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+0.25\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$0.25\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.125\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.125\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_4)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\sin(\theta_4)+$$
$$0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-0.25\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.25\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_5)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_5)-0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_2)\,\sin(\theta_5)-$$
$$0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\cos(\theta_5)+0.25\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.125\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_2\,a_3\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.25\,a_2\,a_3\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_3\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.25\,a_2\,a_3\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-$$
$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2-0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_4)^2+$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_4)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2-$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_4)^2-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_5)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_4)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\cos(\theta_5)^2-0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_2)+$$
$$0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_2)+0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.25\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_2)\,\sin(\theta_4)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+$$

$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)+$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)-\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)-$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2+0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-I_{\mathrm{xy},3}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$I_{\mathrm{xy},3}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.25\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.375\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.375\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,{\cos\left(\theta_2\right)}^2-0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,{\cos\left(\theta_2\right)}^2-$$
$$0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)-0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_1\,a_3\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_1\,a_3\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_1\,a_3\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.25\,a_1\,a_3\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)-0.5\,a_1\,a_3\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.5\,a_1\,a_3\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_1\,a_3\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.5\,a_1\,a_3\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)-0.5\,a_1\,a_3\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.5\,a_1\,a_3\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)-$$

$$0.5\,a_1\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)-0.5\,a_1\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)+0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)^2-0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)-0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)-0.5\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_2)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_3)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_5)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_4)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_5)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.375\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5)+0.375\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2\theta_5\cos(\theta_2)^2+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)$$

$$+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)-0.125\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)+$$
$$0.5\,a_2\,a_3\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,-\,0.25\,a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,+\,0.5\,a_2\,a_3\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,-$$
$$0.25\,a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)+0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)-$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$

$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)-0.25\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)+0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)-0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)+$$
$$0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)+0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)+$$
$$0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$

$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.25\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) -$
$0.5\,a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.125\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) -$
$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.125\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 0.125\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) -$
$0.25\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
${a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$0.25\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - {a_4}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - {a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
${a_4}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - {a_4}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - {a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
$0.25\,{a_4}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - {a_4}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - {a_4}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
${a_4}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) -$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) + 0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) +$
$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2 - 0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2 - 0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2 -$
$0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) -$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) -$
${\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) -$
${\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) +$
${\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) +$
${\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) -$
${\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3) +$
${\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4) - {\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2) - {\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2) -$

$$
\begin{aligned}
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_2) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_2)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2)^2 - 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2)^2 - \\
&0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2)^2 - \mathrm{lc}_{4,2}\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_2) \cos(\theta_3) \cos(\theta_4) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) \sin(\theta_2) + \\
&0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_3 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) \sin(\theta_2) + 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_4 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) \sin(\theta_2) + \\
&0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_5 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) \sin(\theta_2) + 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) \sin(\theta_2)
\end{aligned}
\tag{A28}
$$

$$C_{12} = I_{xy,2}\,\dot{\theta}_2\,\sin(\theta_2)+I_{xz,2}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)-0.5\,I_{xx,2}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.25\,I_{xx,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.25\,I_{xx,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.25\,I_{yy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.25\,I_{yy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.25\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.5\,I_{zz,2}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+$$
$$0.5\,I_{zz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.5\,I_{zz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.5\,I_{zz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-I_{yz,2}\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,I_{zz,3}\,\dot{\theta}_3\,\cos(\theta_2)-$$
$$0.5\,I_{zz,4}\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,I_{zz,4}\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,I_{zz,5}\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,I_{zz,5}\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,I_{zz,5}\,\dot{\theta}_5\,\cos(\theta_2)+0.25\,I_{xx,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)-$$
$$0.25\,I_{yy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)-0.5\,I_{xy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+0.5\,I_{xx,3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+I_{yz,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.5\,I_{yy,3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-I_{xy,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_2)+I_{xz,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-I_{xy,3}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$0.125\,{a_2}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.5\,{a_2}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.5\,{a_2}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+$$
$$0.5\,{a_2}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.5\,I_{xx,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,I_{yy,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+$$
$$0.5\,{\mathrm{lc}_{2,1}}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.5\,{\mathrm{lc}_{2,3}}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-$$
$$0.5\,{\mathrm{lc}_{3,3}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.5\,{\mathrm{lc}_{4,3}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-0.5\,{\mathrm{lc}_{5,3}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+I_{xz,3}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)-$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)-$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)-$$
$$I_{yz,3}\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2)-\mathrm{lc}_{2,1}\,\mathrm{lc}_{2,2}\,m_2\,\dot{\theta}_2\,\sin(\theta_2)-0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)-$$
$$0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-0.5\,I_{xx,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{xx,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,I_{yy,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$0.5\,I_{yy,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)+$$
$$I_{xy,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+I_{yz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+I_{xz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{xz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-I_{yz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-0.5\,a_2\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\cos(2.0\,\theta_2)-a_2\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)-a_2\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)-$$
$$a_2\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)-\mathrm{lc}_{2,1}\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\cos(2.0\,\theta_2)+0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)-0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)+$$
$$0.5\,a_2\,\mathrm{lc}_{2,1}\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)-$$
$$0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)-0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+I_{xz,4}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.25\,I_{xx,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,I_{yy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-I_{yz,4}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$I_{yz,4}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-I_{xz,4}\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_1\,a_2\,m_2\,\dot{\theta}_1\,\cos(\theta_2)-a_1\,a_2\,m_3\,\dot{\theta}_1\,\cos(\theta_2)-$$
$$a_1\,a_2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)-a_1\,a_2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)+0.5\,I_{xx,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{xx,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,I_{yy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{yy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-a_1\,\mathrm{lc}_{2,1}\,m_2\,\dot{\theta}_1\,\cos(\theta_2)-$$
$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)+\mathrm{lc}_{2,2}\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_2\,\cos(\theta_2)-I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_2)-I_{xy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$I_{xy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-I_{xy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-I_{xy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$a_1\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\sin(\theta_2)-0.5\,a_2\,\mathrm{lc}_{2,2}\,m_2\,\dot{\theta}_2\,\sin(\theta_2)-a_1\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(\theta_2)-a_1\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)-a_1\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)-$$

$$0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)-0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)-0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)-$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_5)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+$$
$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,-\,0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,+\,0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,+\,0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_2)\,-\,0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,+$$
$$0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,+\,0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,-\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,-$$
$$a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)+0.5\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+a_2\,a_3\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$a_2\,a_3\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)+\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_2)-\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$

$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-$$
$$a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)-0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)-a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-0.5\,a_1\,a_3\,m_3\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-a_1\,a_3\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-a_1\,a_3\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)+a_2\,a_3\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)+a_2\,a_3\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)-a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)+a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)-a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$$
$$a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$

$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)-a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-$$

$$
\begin{aligned}
&a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+\\
&a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+\\
&\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,a_4\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-\\
&0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-\\
&0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\\
&0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+\\
&0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_2)+\\
&\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\\
&\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+\\
&0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\\
&0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+\\
&0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)-\\
&0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_5)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)-\\
&0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+\\
&0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+\\
&0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\\
&0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-\\
&\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-\\
&0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+\\
&a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+\\
&\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-\\
&a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-\\
&a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-\\
&a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-\\
&0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+
\end{aligned}
$$

$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$

$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$
$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\sin(\theta_2)+$
$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$
$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$

$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_2)\,\sin(\theta_5) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) + 0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2) \tag{A29}$$

$$C_{13} = 0.5\,I_{xy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)+0.25\,I_{xx,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-0.25\,I_{yy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-0.5\,I_{zz,3}\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,I_{zz,4}\,\dot{\theta}_2\,\cos(\theta_2)-$$
$$0.5\,I_{zz,5}\,\dot{\theta}_2\,\cos(\theta_2)+0.5\,I_{xy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)+0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)+0.25\,I_{xx,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+$$
$$0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) - 0.25\,I_{yy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) -$$
$$0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.5\,I_{xy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.5\,I_{xx,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,I_{yy,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-I_{xy,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,I_{xz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-0.5\,I_{yz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)+$$
$$0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-I_{xz,3}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)+I_{yz,3}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-$$
$$0.5\,I_{xx,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{yy,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+$$
$$0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,I_{xz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) -$$
$$0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,I_{yz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,I_{yz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,I_{xz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)-$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) - 0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3) - 0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3) +$$
$$0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)-0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+0.25\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.25\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_3)+0.5\,a_1\,a_3\,m_3\,\dot{\theta}_3\,\cos(\theta_3)+0.5\,a_2\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_3)+a_1\,a_3\,m_4\,\dot{\theta}_3\,\cos(\theta_3)+0.5\,a_2\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_3)+$$
$$a_1\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_3)+0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_3)+$$
$$a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(\theta_3)-a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(\theta_3)-0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-$$
$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$

$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,a_2\,a_3\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.5\,a_2\,a_3\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+a_1\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)-a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+$$
$$a_1\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)+a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)+$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,a_1\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-a_1\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-a_1\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-$$
$$0.5\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)-a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)-a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+$$

$$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3) - a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2) - a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2) - 0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4) -$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3) - a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4) - a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3) + a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4) -$$
$$a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4) - a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3) + a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2) + a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5) +$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2) - 0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_1\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4) - a_1\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4) - a_1\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4) +$$
$$a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4) - 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3) + a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3) + a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3) - 0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4) - a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4) + a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4) - a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_5) +$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) - 0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3) -$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) - 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) - 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4) -$$
$$a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4) - 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) -$$
$$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4) + 0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3) + a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4) +$$
$$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4) - 0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) +$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4) +$$
$$a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4) + 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) + 0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4) +$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) -$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4) + 0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3) +$$
$$0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) + 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) -$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) - 0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) +$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) + 0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) - 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) - 0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) -$$

$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-$$

$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4) - 0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4) - 0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4) -$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4) - 0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5) + 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) +$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) + 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) + 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) +$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) + 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) +$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) + 0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) +$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) + 0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) -$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) - 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) -$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) - 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) - 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) +$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) + 0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) - 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) + a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) + a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) + 0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) -$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - 0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) - a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) +$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) + 0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) -$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) -$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) -$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) -$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) - 0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5) -$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) +$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) + 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) -$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) +$$

$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$$

$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) \tag{A30}$$

$$
\begin{aligned}
C_{14} \;=\; & 0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \;+\; 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \;+\; 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \;-\; 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \;+\; 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \;- \\
& 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_5)^2 - 0.5\, I_{\mathrm{zz},4}\, \dot{\theta}_2 \cos(\theta_2) \;- \\
& 0.5\, I_{\mathrm{zz},5}\, \dot{\theta}_2 \cos(\theta_2) - 0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) - 0.125\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 - 0.125\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 - 0.25\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 - \\
& 0.25\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 - 0.125\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.125\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.125\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + \\
& 0.125\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) - I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2 - I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2 - \\
& I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2 + I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2 - I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2 - I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5)^2 + \\
& I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2 + I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5)^2 + I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5)^2 - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) \;- \\
& 0.5\, {a_4}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) + 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) + 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) \;- \\
& 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) - 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) - \\
& 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_5) \sin(\theta_5) - 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) - 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) + 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) + \\
& 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) + 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) + 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) + 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_5) \sin(\theta_5) - \\
& 0.5\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + 0.125\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.125\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - \\
& 0.125\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.125\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) - \\
& 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) - \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) + 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \\
& 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) + \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) + \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) - 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2)^2 - \\
& 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 + 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_3)^2 + 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 + \\
& 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 + 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_5)^2 - 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 + \\
& 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_3)^2 + 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 + 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 + \\
& 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_5)^2 + 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 + 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \cos(\theta_2)^2 - \\
& 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 - 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \cos(\theta_2)^2 + 0.5\, I_{\mathrm{xz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_3) \cos(\theta_4) - \\
& 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 - 0.5\, I_{\mathrm{yz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_3) \sin(\theta_4) - 0.5\, I_{\mathrm{yz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_4) \sin(\theta_3) - \\
& 0.5\, I_{\mathrm{xz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \sin(\theta_3) \sin(\theta_4) + 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) + 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) + \\
& 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) - \\
& 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) - 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) -
\end{aligned}
$$

$$0.25\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-0.25\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-0.125\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,I_{xy,4}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)-0.75\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)-0.375\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_4)-$$
$$0.75\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_4)-I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.75\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_4)+0.03125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.03125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+$$
$$0.125\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.125\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_4)-$$
$$0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(2.0\,\theta_2)+0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_4)-0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(2.0\,\theta_2)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_2)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)^2\,\sin(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)^2\,\sin(\theta_2)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_4)-0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(2.0\,\theta_2)+$$
$$0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_4)-$$
$$0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$

$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^2+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,{\cos\left(\theta_2\right)}^2+I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},4}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},4}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$I_{\mathrm{yy},4}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-I_{\mathrm{yy},4}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\cos\left(\theta_2\right)+0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_4\right)}^2-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_4\right)}^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_5\right)}^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2-$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)+$$

$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(\theta_5)\,\sin(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5)\,\sin(\theta_2)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2-$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2-I_{\mathrm{xy},5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+a_1\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+$$
$$a_1\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)-$$
$$0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)+$$
$$a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)-0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)-a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)-a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_5)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_5)-0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)-$$

$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_1\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_1\,a_4\,m_5\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-a_1\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^2+$$
$$0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^2+0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2+0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)+0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-$$
$$a_4^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-a_4^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-a_4^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_5\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^2-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$

$$
\begin{aligned}
&\mathrm{lc}_{4,1}{}^2\, m_4\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \sin(\theta_2) - \mathrm{lc}_{4,1}{}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + \mathrm{lc}_{4,2}{}^2\, m_4\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \sin(\theta_2) - \\
&\mathrm{lc}_{4,1}{}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \sin(\theta_4) + \mathrm{lc}_{4,2}{}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + \mathrm{lc}_{4,2}{}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \sin(\theta_4) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_5)^2\, \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_2) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \sin(\theta_4) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_5)^2\, \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_2) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \sin(\theta_4) + \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_3)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_3) - \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_5)\, \sin(\theta_5) - \\
&\mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1\, \cos(\theta_3)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_3) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) + \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_5)\, \sin(\theta_5) + \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) + \\
&\mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) + \\
&0.125\, a_5{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2) - 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(\theta_2)^2 + \\
&0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) - 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) - \\
&0.25\, a_4\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)^2 - 0.25\, a_4\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \cos(\theta_2)^2 + 0.5\, a_2\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \sin(\theta_4) + \\
&0.5\, a_2\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_4)\, \sin(\theta_3) + 0.5\, a_3\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4) + 0.5\, a_3\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4) - \\
&0.25\, a_4\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4) - 0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_4)\, \sin(\theta_5) - 0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_5)\, \sin(\theta_4) - \\
&0.5\, a_4\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4) + 0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) + 0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + \\
&0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \cos(\theta_4)\, \cos(\theta_5) + 0.25\, a_2\, a_4\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) + 0.5\, a_2\, a_4\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) + \\
&0.25\, a_3\, a_4\, m_4\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4) + 0.5\, a_3\, a_4\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4) - 0.125\, a_3\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&0.125\, a_3\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + 0.125\, a_3\, a_5\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) + 0.125\, a_3\, a_5\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + \\
&0.5\, \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2) - 0.5\, \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2) - \\
&0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4) - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) - \\
&0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)\, \sin(\theta_2) - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_2) + \\
&0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)^2 + 0.5\, a_2\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) + 0.5\, a_3\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4) - \\
&0.25\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_4)\, \sin(\theta_5) + 0.25\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + 0.25\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) + \\
&0.25\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) - 0.125\, a_5{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) - 0.125\, a_5{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) - \\
&0.125\, a_5{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)^2 + 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)^2 + \\
&0.5\, \mathrm{lc}_{4,2}\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \sin(\theta_4) + 0.5\, \mathrm{lc}_{4,2}\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_4)\, \sin(\theta_3) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) - \\
&0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)\, \sin(\theta_2) + \\
&0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) + 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) + \\
&0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)\, \sin(\theta_2) + 0.25\, a_4\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) + \\
&0.5\, a_4\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) - 0.25\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 0.5\, \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) - \\
&0.5\, \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) - 0.5\, \mathrm{lc}_{5,1}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2) + \\
&0.5\, \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) + 0.5\, \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) + \\
&0.5\, \mathrm{lc}_{5,2}{}^2\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2) + 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,3}\, m_4\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4) + 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2) \\
&0.125\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5) - 0.25\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5) -
\end{aligned}
$$

$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$$
$$a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$

$$
\begin{aligned}
&a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+\\
&0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-\\
&0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-\\
&0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&a_2\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-\\
&0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-\\
&\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-\\
&0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-\\
&2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)-2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)-2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_4)-\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-\\
&0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-\\
&0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+\\
&0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+\\
&0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+\\
&0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5)+\\
&0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+
\end{aligned}
$$

$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-$$
$$a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+$$

$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+$$

$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)-$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)-$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2-$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$
$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2+$
$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$
$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$
$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$
$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$
$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$

$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$${a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$${\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$

$$
\begin{aligned}
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)+\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_4)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+\\
&2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-\\
&4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+\\
&a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+\\
&a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+\\
&2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_4)-\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\\
&2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-\\
&2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\\
&2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)
\end{aligned}
$$

(A31)

$$C_{15} = 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1 + 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_4)^2 - 0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_5)^2 -$$
$$0.5\,I_{\mathrm{zz},5}\,\dot{\theta}_2\cos(\theta_2) - 0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1 - 0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1 - I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2 - I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2 -$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2 + I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2 + I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2 + I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) + 0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) - 0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) - 0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) -$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) - 0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) + 0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) + 0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) +$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) - 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) -$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) - 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) - 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) +$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) +$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) +$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) + 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) + 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) -$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) -$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2 + 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2 +$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2 + 0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)^2 - 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2 + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2 +$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2 + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)^2 + 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5) +$$
$$0.125\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5) + 0.125\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4) + 0.125\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3) -$$
$$0.125\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5) - 0.125\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4) - 0.125\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3) -$$
$$0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) - 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5) - 0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4) -$$
$$0.125\,I_{\mathrm{xx},5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) + 0.125\,I_{\mathrm{yy},5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) - 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) +$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) + 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) + 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 +$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) + 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) + 0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) - 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) +$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) - 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) + 0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) - 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) -$$
$$0.375\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_2) - 0.75\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_5) + 0.75\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\sin(\theta_5) +$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) -$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) -$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) -$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) +$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) +$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) +$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) -$$
$$0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_5) + 0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(2.0\,\theta_2) + 0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(\theta_5) +$$
$$0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(\theta_5) - 0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - 0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) -$$

$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2)+$$
$$I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2)+I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)+$$
$$I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_2)-$$
$$I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2\,\sin(\theta_2)-I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_2)-$$
$$I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)-$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\cos(\theta_2)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_5)\,\cos(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_5)\,\cos(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_5)\,\cos(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_5)\,\cos(\theta_2)+I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_5)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_5)\,\cos(\theta_2)-0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_5)-$$
$$0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_5)\,\cos(\theta_2)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_5)\,\cos(\theta_2)-0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2-0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(\theta_5)\,\sin(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_5)\,\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5)\,\sin(\theta_2)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2-I_{xy,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$

$I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-$
$I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$
$I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$
$I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$
$I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,{\cos(\theta_2)}^2-0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)+0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+$
$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_5)+$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2-$
$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,{\cos(\theta_2)}^2-0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,{\cos(\theta_2)}^2+$
$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2+0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,{\cos(\theta_2)}^2+$
$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,{\cos(\theta_2)}^2-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_3)+$
$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)+0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)+$
$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_5)+0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2+$
$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2+0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,{\cos(\theta_2)}^2+$
$0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_5)+0.25\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2-0.25\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,{\cos(\theta_2)}^2+$
$0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_3)}^2\,\sin(\theta_2)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_4)}^2\,\sin(\theta_2)+$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_3)\,\sin(\theta_3)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_5)}^2\,\sin(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,{\cos(\theta_4)}^2\,\sin(\theta_3)+$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_4)\,\sin(\theta_4)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,{\cos(\theta_5)}^2\,\sin(\theta_3)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_5)\,\sin(\theta_5)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,{\cos(\theta_5)}^2\,\sin(\theta_4)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,\cos(\theta_5)\,\sin(\theta_5)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_4)}^2\,\cos(\theta_5)\,\sin(\theta_5)-4.0\,I_{xy,5}\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,{\cos(\theta_3)}^2\,{\cos(\theta_4)}^2\,{\cos(\theta_5)}^2+0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)-$
$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_3)}^2\,\sin(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_4)}^2\,\sin(\theta_2)+$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_3)\,\sin(\theta_3)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_5)}^2\,\sin(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,{\cos(\theta_4)}^2\,\sin(\theta_3)+$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_4)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,{\cos(\theta_5)}^2\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,{\cos(\theta_5)}^2\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,\cos(\theta_5)\,\sin(\theta_5)-$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos(\theta_4)}^2\,\cos(\theta_5)\,\sin(\theta_5)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_3)}^2\,{\cos(\theta_4)}^2\,\sin(\theta_2)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_3)}^2\,{\cos(\theta_5)}^2\,\sin(\theta_2)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_3)\,{\cos(\theta_4)}^2\,\sin(\theta_3)-$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,{\cos(\theta_4)}^2\,{\cos(\theta_5)}^2\,\sin(\theta_2)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_3)\,{\cos(\theta_5)}^2\,\sin(\theta_3)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,{\cos(\theta_3)}^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,{\cos(\theta_4)}^2\,{\cos(\theta_5)}^2\,\sin(\theta_3)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,\cos(\theta_4)\,{\cos(\theta_5)}^2\,\sin(\theta_4)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,{\cos(\theta_3)}^2\,\cos(\theta_5)\,\sin(\theta_5)-$
$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_2)}^2\,{\cos(\theta_4)}^2\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,\cos(\theta_4)\,{\cos(\theta_5)}^2\,\sin(\theta_4)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos(\theta_3)}^2\,{\cos(\theta_4)}^2\,\cos(\theta_5)\,\sin(\theta_5)+$

$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_2\right)-$$
$$\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+$$
$$\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-$$
$$\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$

$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_4)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$

$$2.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + 2.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) -$$
$$2.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + 2.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) -$$
$$0.25\, a_4\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(\theta_5) - 0.25\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)^2 +$$
$$0.25\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)^2 + 0.25\, a_4\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \sin(\theta_5) +$$
$$0.25\, a_4\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_5) + 0.25\, a_4\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \cos(\theta_5) + 0.125\, a_4\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(\theta_5) +$$
$$0.125\, a_4\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(\theta_5) + 0.125\, a_4\, a_5\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_5) + 0.25\, a_4\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(\theta_5) +$$
$$0.25\, a_4\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(\theta_5) + 0.25\, a_4\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_5) + 4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_2)\, \sin(\theta_3) +$$
$$4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_2)\, \sin(\theta_4) + 4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_2)\, \sin(\theta_5) +$$
$$4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + 4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) +$$
$$4.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + 0.5\, a_2\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5) +$$
$$0.5\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \cos(\theta_5) + 0.25\, a_2\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) +$$
$$0.25\, a_2\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + 0.25\, a_2\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3) + 0.25\, a_3\, a_5\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \sin(\theta_5) +$$
$$0.25\, a_3\, a_5\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_5)\, \sin(\theta_4) + 0.25\, a_3\, a_5\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \cos(\theta_5) + 0.5\, a_2\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) +$$
$$0.5\, a_2\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + 0.5\, a_2\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3) +$$
$$0.5\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \sin(\theta_5) + 0.5\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_5)\, \sin(\theta_4) +$$
$$0.5\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \cos(\theta_5) - 0.0625\, {a_5}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) +$$
$$0.5\, \mathrm{lc}_{5,2}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5) - 0.5\, a_2\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) -$$
$$0.5\, a_2\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_4)\, \sin(\theta_3)\, \sin(\theta_5) - 0.5\, a_2\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4) -$$
$$0.5\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4)\, \sin(\theta_5) - 0.5\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_4)\, \sin(\theta_5) -$$
$$0.5\, a_3\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \cos(\theta_5)\, \sin(\theta_4) + 0.25\, a_5\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) +$$
$$0.25\, a_5\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + 0.25\, a_5\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3) -$$
$$0.25\, a_2\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 0.25\, a_3\, a_5\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4)\, \sin(\theta_5) - 0.25\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)$$
$$0.25\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) + 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_4)\, \sin(\theta_5) +$$
$$0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \cos(\theta_5)\, \sin(\theta_4) + 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3) -$$
$$a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_4)^2\, \sin(\theta_2) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_3)^2 \cos(\theta_5)^2\, \sin(\theta_2) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) -$$
$$a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(\theta_2)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_2) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_4)\, \sin(\theta_4) +$$
$$a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(\theta_3)\, \cos(\theta_4)^2 \cos(\theta_5)^2\, \sin(\theta_3) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2\, \cos(\theta_5)\, \sin(\theta_5) -$$
$$a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) + a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) + a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_5) -$$
$$0.5\, a_2\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 0.5\, a_3\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_2\, \sin(2.0\,\theta_3)\, \cos(\theta_2)\, \sin(\theta_4)\, \sin(\theta_5) -$$
$$0.125\, a_4\, a_5\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(\theta_5) + 0.0625\, {a_5}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) +$$
$$0.0625\, {a_5}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) + 0.0625\, {a_5}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_5)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \cos(\theta_2)\, \sin(\theta_2) -$$
$$0.5\, \mathrm{lc}_{5,2}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 0.5\, \mathrm{lc}_{5,2}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_4)\, \sin(\theta_3)\, \sin(\theta_5) -$$
$$0.5\, \mathrm{lc}_{5,2}\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4) - 0.25\, a_4\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_2)\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(\theta_5) +$$
$$0.5\, a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_2\, \cos(2.0\,\theta_3)\, \cos(2.0\,\theta_4)\, \cos(2.0\,\theta_5)\, \cos(\theta_2) - 0.25\, a_5\, \mathrm{lc}_{5,3}\, m_5\, \dot{\theta}_1\, \sin(2.0\,\theta_2)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) +$$
$$0.25\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_3)\, \sin(2.0\,\theta_4)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) + 0.25\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_1\, \cos(2.0\,\theta_4)\, \sin(2.0\,\theta_3)\, \sin(2.0\,\theta_5)\, \cos(\theta_2)\, \sin(\theta_2) +$$

$$0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)+0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+$$
$$0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)+0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$

$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)-$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2-$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$
$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2+$
$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$
$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$
$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$
$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$

$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$

$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right) \tag{A32}$$

$$C_{21} = -I_{xz,2}\,\dot{\theta}_1\,\cos(2.0\,\theta_2) + 0.5\,I_{xx,2}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.25\,I_{xx,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.25\,I_{xx,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) +$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.25\,I_{yy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.25\,I_{yy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.25\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,I_{zz,2}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.5\,I_{zz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,I_{zz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,I_{zz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.5\,I_{zz,3}\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,I_{zz,4}\,\dot{\theta}_3\,\cos(\theta_2) +$$
$$0.5\,I_{zz,4}\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,I_{zz,5}\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,I_{zz,5}\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,I_{zz,5}\,\dot{\theta}_5\,\cos(\theta_2) - 0.25\,I_{xx,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) +$$
$$0.25\,I_{yy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) + 0.5\,I_{xy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.5\,I_{xx,3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - I_{yz,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3) -$$
$$0.5\,I_{yy,3}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - I_{xz,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3) - I_{xy,3}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2) - 0.125\,{a_2}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.5\,{a_2}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,{a_2}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,{a_2}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.5\,{\mathrm{lc}_{2,1}}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.5\,{\mathrm{lc}_{2,3}}^2\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.5\,{\mathrm{lc}_{3,3}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) +$$
$$0.5\,{\mathrm{lc}_{4,3}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.5\,{\mathrm{lc}_{5,3}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) +$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2) +$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2) -$$
$$I_{yz,3}\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2) + 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_2) - I_{xz,3}\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3) - 0.5\,I_{xx,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,I_{xx,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,I_{yy,4}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,I_{yy,4}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) - 0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) - I_{yz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) -$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,{a_3}^2\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,{a_3}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$I_{xz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4) - I_{xz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3) - 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + I_{yz,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_2\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\cos(2.0\,\theta_2) + a_2\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2) +$$
$$a_2\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2) + a_2\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2) + \mathrm{lc}_{2,1}\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\cos(2.0\,\theta_2) - 0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2) +$$
$$0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2) - 0.5\,a_2\,\mathrm{lc}_{2,1}\,m_2\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2) -$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2) - 0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2) + 0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4) +$$
$$0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.25\,I_{xx,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.25\,I_{yy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2) - I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2) - I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) + I_{yz,4}\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + I_{yz,4}\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$0.5\,a_1\,a_2\,m_2\,\dot{\theta}_1\,\cos(\theta_2) + a_1\,a_2\,m_3\,\dot{\theta}_1\,\cos(\theta_2) + a_1\,a_2\,m_4\,\dot{\theta}_1\,\cos(\theta_2) + a_1\,a_2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,I_{xx,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$0.5\,I_{xx,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) - 0.5\,I_{yy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) - 0.5\,I_{yy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$a_1\,\mathrm{lc}_{2,1}\,m_2\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$I_{xy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + a_1\,\mathrm{lc}_{2,3}\,m_2\,\dot{\theta}_1\,\sin(\theta_2) + a_1\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(\theta_2) +$$
$$a_1\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2) + a_1\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2) + 0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) + 0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) +$$
$$0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) + 0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2) - 0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2) +$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2) - 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_5) - 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4) -$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3) - I_{xz,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - 0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3) -$$

$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)-$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+$$
$$a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-a_2\,a_3\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)-a_2\,a_3\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)+\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-I_{\mathrm{xy},5}\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-I_{\mathrm{xz},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$

$I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$
$I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)+a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)-$
$I_{yz,5}\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-I_{yz,5}\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)+a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_1\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+$
$a_1\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+a_1\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)+a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)+$
$a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$
$0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)-$
$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+$
$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)+$
$0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)+a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$
$0.125\,{a_4}^2\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$
$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$
$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+$
$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+$
$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$
$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$
$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$
$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-$
$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-$
$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$
$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+$
$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$
$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+$
$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$
$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$
$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+$
$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$

$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$
$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$
$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)-$
$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)+a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+$
$a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$
$a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$
$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$
$a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$
$a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_4\right)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)-$
$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$
$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$
$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-$
$a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$
$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$
$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$
$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$
$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$

$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_5)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$

$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$$

$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-$$
$$a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-$$

$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_2\right) \tag{A33}$$

$$
\begin{aligned}
C_{22} \;=\; & 2.0\, I_{xy,4}\, \dot{\theta}_3 \cos(\theta_3)^2 \;-\; I_{xy,4}\, \dot{\theta}_4 \;-\; I_{xy,5}\, \dot{\theta}_3 \;-\; I_{xy,5}\, \dot{\theta}_4 \;-\; I_{xy,5}\, \dot{\theta}_5 \;-\; I_{xy,4}\, \dot{\theta}_3 \;+\; 2.0\, I_{xy,4}\, \dot{\theta}_3 \cos(\theta_4)^2 \;+ \\
& 2.0\, I_{xy,4}\, \dot{\theta}_4 \cos(\theta_3)^2 + 2\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_3)^2 + 2.0\, I_{xy,4}\, \dot{\theta}_4 \cos(\theta_4)^2 + 2\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_4)^2 + 2\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_3)^2 + 2\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_5)^2 + \\
& 2\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_4)^2 + 2\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_3)^2 + 2\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_5)^2 + 2\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_4)^2 + 2\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_5)^2 - I_{xy,3}\, \dot{\theta}_3 \;\cos(2.0\,\theta_3) - \\
& 0.5\, I_{xx,3}\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) + 0.5\, I_{yy,3}\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) + 0.5\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 + 0.5\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 + 0.5\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 + 0.5\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 + \\
& 0.5\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \;+\; \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \;+\; \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \;+\; \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \;+\; \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \;+\; \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \;+ \\
& 0.125\, {a_3}^2\, m_3\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) + 0.5\, {a_3}^2\, m_4\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) + 0.5\, {a_3}^2\, m_5\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) - 4.0\, I_{xy,4}\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_4)^2 - \\
& 4.0\, I_{xy,4}\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_4)^2 - 4\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_4)^2 - 4\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_3)^2 \cos(\theta_5)^2 - 4\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_4)^2 - \\
& 4\, I_{xy,5}\, \dot{\theta}_3 \cos(\theta_4)^2 \cos(\theta_5)^2 - 4\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \cos(\theta_5)^2 - 4\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_3)^2 \cos(\theta_4)^2 - 4\, I_{xy,5}\, \dot{\theta}_4 \cos(\theta_4)^2 \cos(\theta_5)^2 - \\
& 4\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_3)^2 \cos(\theta_5)^2 - 4\, I_{xy,5}\, \dot{\theta}_5 \cos(\theta_4)^2 \cos(\theta_5)^2 + 0.5\, {\mathrm{lc}_{3,1}}^2\, m_3\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) - 0.5\, {\mathrm{lc}_{3,2}}^2\, m_3\, \dot{\theta}_3 \;\sin(2.0\,\theta_3) + \\
& I_{xx,4}\, \dot{\theta}_3 \;\cos(\theta_3)\, \sin(\theta_3) + I_{xx,4}\, \dot{\theta}_4 \;\cos(\theta_3)\, \sin(\theta_3) + I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \sin(\theta_3) + I_{xx,4}\, \dot{\theta}_3 \;\cos(\theta_4)\, \sin(\theta_4) + I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \sin(\theta_3) + \\
& I_{xx,4}\, \dot{\theta}_4 \;\cos(\theta_4)\, \sin(\theta_4) + I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_4)\, \sin(\theta_4) + I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_3)\, \sin(\theta_3) + I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_4)\, \sin(\theta_4) + I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_5)\, \sin(\theta_5) + \\
& I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_4)\, \sin(\theta_4) + I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_5)\, \sin(\theta_5) + I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_5)\, \sin(\theta_5) - I_{yy,4}\, \dot{\theta}_3 \;\cos(\theta_3)\, \sin(\theta_3) - I_{yy,4}\, \dot{\theta}_4 \;\cos(\theta_3)\, \sin(\theta_3) - \\
& I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \sin(\theta_3) - I_{yy,4}\, \dot{\theta}_3 \;\cos(\theta_4)\, \sin(\theta_4) - I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \sin(\theta_3) - I_{yy,4}\, \dot{\theta}_4 \;\cos(\theta_4)\, \sin(\theta_4) - I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_4)\, \sin(\theta_4) - \\
& I_{yy,5}\, \dot{\theta}_5 \;\cos(\theta_3)\, \sin(\theta_3) - I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_4)\, \sin(\theta_4) - I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_5)\, \sin(\theta_5) - I_{yy,5}\, \dot{\theta}_5 \;\cos(\theta_4)\, \sin(\theta_4) - I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_5)\, \sin(\theta_5) - \\
& I_{yy,5}\, \dot{\theta}_5 \;\cos(\theta_5)\, \sin(\theta_5) - 2.0\, I_{xx,4}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) - 2.0\, I_{xx,4}\, \dot{\theta}_3 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) - 2.0\, I_{xx,4}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) - 2.0\, I_{xx,4}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) - 2.0\, I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_3 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) - 2.0\, I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) - 2.0\, I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) - 2.0\, I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) - 2.0\, I_{xx,5}\, \dot{\theta}_3 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_3 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) - 2.0\, I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) - 2.0\, I_{xx,5}\, \dot{\theta}_5 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_3 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) - 2.0\, I_{xx,5}\, \dot{\theta}_4 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - 2.0\, I_{xx,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_4 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) - 2.0\, I_{xx,5}\, \dot{\theta}_5 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) - 2.0\, I_{xx,5}\, \dot{\theta}_5 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_5 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,4}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + 2.0\, I_{yy,4}\, \dot{\theta}_3 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) + \\
& 2.0\, I_{yy,4}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + 2.0\, I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + 2.0\, I_{yy,4}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) + 2.0\, I_{yy,5}\, \dot{\theta}_3 \cos(\theta_3)^2 \;\cos(\theta_4)\, \sin(\theta_4) + 2.0\, I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_4)^2\, \sin(\theta_3) + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) + 2.0\, I_{yy,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,5}\, \dot{\theta}_5 \;\cos(\theta_3)\, \cos(\theta_5)^2\, \sin(\theta_3) + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_3 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) + 2.0\, I_{yy,5}\, \dot{\theta}_3 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,5}\, \dot{\theta}_4 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_4 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,5}\, \dot{\theta}_4 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,5}\, \dot{\theta}_5 \;\cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_4) + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_5 \cos(\theta_3)^2 \;\cos(\theta_5)\, \sin(\theta_5) + 2.0\, I_{yy,5}\, \dot{\theta}_5 \cos(\theta_4)^2 \;\cos(\theta_5)\, \sin(\theta_5) - a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \cos(\theta_3)^2 - a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \cos(\theta_4)^2 - \\
& a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \cos(\theta_3)^2 - a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \cos(\theta_4)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_4)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2 - \\
& a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_5)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_4)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_5)^2 - a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_4)^2 - \\
& a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_5)^2 \;-\; 2\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \cos(\theta_3)^2 \;-\; 2\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_3 \cos(\theta_4)^2 \;-\; 2\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \cos(\theta_3)^2 \;- \\
& 2\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_4 \cos(\theta_4)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_4)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2 - \\
& 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_5)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_4)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_5)^2 - \\
& 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_4)^2 - 2.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_5)^2 + 0.5\, a_3\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_3 \;\cos(2.0\,\theta_3) + \mathrm{lc}_{3,1}\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_3 \;\cos(2.0\,\theta_3) +
\end{aligned}
$$

$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\sin\left(2.0\,\theta_3\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$${a_4}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{a_4}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+8\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+8\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+$$
$$8\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$${\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$${\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$${\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,a_3\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)+$$
$$a_2\,a_3\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)+a_2\,a_3\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)+a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_3\,\cos\left(\theta_3\right)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_3\,\sin\left(\theta_3\right)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$

$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+$
$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+$
$a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+$
$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+$
$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+$
$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+$
$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2+$
$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\cos(\theta_5)^2-$
$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+$
$4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_5)^2+$
$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2\cos(\theta_5)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_5)^2+$
$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2\cos(\theta_5)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_5)^2+$
$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\cos(\theta_5)^2+4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$
$4\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$
$4\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$
$4\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)-$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)-$
$a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)-$
$a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_4)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_3)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_3)-$
$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_4)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_3)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_4)-$
$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_5)-$
$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_4)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_5)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)-$
$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,{a_4}^2\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_4}^2\,m_4\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.5\,{a_4}^2\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,{a_4}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_4}^2\,m_4\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$2.0\,{a_4}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,{a_4}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$
$2.0\,{a_4}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+$

$$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$$
$$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-{a_5}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$${a_5}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-{a_5}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$${a_5}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-{a_5}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-{a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$${a_5}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$

$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_3\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_4\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$8\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$8\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$8\,I_{\mathrm{xy},5}\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\cos(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\cos(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+$$
$$a_5{}^2\,m_5\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+a_5{}^2\,m_5\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$

$$
\begin{aligned}
&{a_5}^2\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + 4.0\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&4.0\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 4.0\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&4.0\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - 4.0\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) - \\
&4.0\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + \\
&4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + \\
&4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + \\
&4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + 4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + 8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + \\
&8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + 8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_3 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + 8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)^2\, \sin(\theta_3)\, \sin(\theta_4) + \\
&8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_4 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + 8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)^2\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_5) + \\
&8.0\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_5 \cos(\theta_3)^2\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_4)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_3\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + \\
&4.0\, a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_4\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5) + 4.0\, a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_5\, \cos(\theta_3)\, \cos(\theta_4)\, \cos(\theta_5)\, \sin(\theta_3)\, \sin(\theta_4)\, \sin(\theta_5)
\end{aligned}
\tag{A34}
$$

$$C_{23} = I_{xz,3}\,\dot{\theta}_3\,\sin(\theta_3) - I_{xy,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3) - 0.5\,I_{xx,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + 0.5\,I_{yy,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + I_{yz,3}\,\dot{\theta}_3\,\cos(\theta_3) +$$
$$0.5\,I_{zz,3}\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,I_{zz,4}\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,I_{zz,5}\,\dot{\theta}_1\,\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) - 0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) +$$
$$I_{xy,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,I_{xx,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,I_{yy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - I_{xy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2) +$$
$$0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + 0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + 0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3) -$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3) + I_{yz,4}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4) + I_{yz,4}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4) + 0.125\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2) +$$
$$0.5\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) + I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4) +$$
$$I_{xz,4}\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3) + I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4) + I_{xz,4}\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3) - I_{yz,3}\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2) + 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2) -$$
$$I_{xz,3}\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3) - I_{yz,4}\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4) - I_{yz,4}\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4) - \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(\theta_3) - 0.5\,I_{xx,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$0.5\,I_{yy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) -$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) - 0.125\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) +$$
$$I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) + 0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3) + \mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3) + 0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) +$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) + 0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) - 0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) - 0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) + 0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3) -$$
$$I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) - I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) - I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) +$$
$$I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,I_{xx,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) +$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) - I_{yz,4}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2) - I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) -$$
$$I_{yz,5}\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) -$$
$$I_{xz,4}\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - I_{xz,4}\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) - I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) -$$
$$I_{xz,5}\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + I_{yz,4}\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$I_{yz,5}\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\cos(\theta_3) +$$
$$a_2\,a_3\,m_4\,\dot{\theta}_2\,\cos(\theta_3) + a_2\,a_3\,m_5\,\dot{\theta}_2\,\cos(\theta_3) + 0.5\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) - 0.5\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_2) + a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_3) + 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2) - \mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\cos(\theta_3) -$$
$$I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) - a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(\theta_3) - 0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_3\,\sin(\theta_3) -$$
$$a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin(\theta_3) - a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(\theta_3) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) +$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) - 0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.5\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) + 0.5\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4) +$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4) + a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4) + a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4) + I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2) +$$

$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$
$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$
$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$
$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$
$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$
$I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)+a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)+a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)-$
$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)+a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+a_2\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)+a_2\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)-$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_5)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$
$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)+a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)-a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_4)-$
$a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)-$
$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-$
$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)-$
$a_2\,a_4\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+$
$\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)-$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)+0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)+$
$a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$
$\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$
$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-$
$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$
$a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$
$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+$
$a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$
$a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$
$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$
$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$

$$0.5\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$$
$$a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$

$$a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) \tag{A35}$$

$$C_{24} = 2.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_3)^2 - I_{xy,5}\,\dot{\theta}_2 - I_{xy,4}\,\dot{\theta}_2 + 2.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_4)^2 + 2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2 + 2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2 +$$
$$2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_5)^2 + 0.5\,I_{zz,5}\,\dot{\theta}_1\cos(\theta_2) + 0.5\,I_{zz,5}\,\dot{\theta}_1\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_4\,\dot{\theta}_2 + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 + \mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2 +$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 - 4.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2 +$$
$$I_{yz,4}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4) + I_{yz,4}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4) + 0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\cos(\theta_2) + 0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) +$$
$$I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + I_{xx,4}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + I_{xz,4}\,\dot{\theta}_3\cos(\theta_3)\sin(\theta_4) +$$
$$I_{xz,4}\,\dot{\theta}_3\cos(\theta_4)\sin(\theta_3) + I_{xx,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + I_{xz,4}\,\dot{\theta}_4\cos(\theta_3)\sin(\theta_4) + I_{xz,4}\,\dot{\theta}_4\cos(\theta_4)\sin(\theta_3) - I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) -$$
$$I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - I_{yy,4}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2) +$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) + 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) - I_{yz,4}\,\dot{\theta}_3\sin(\theta_3)\sin(\theta_4) - I_{yz,4}\,\dot{\theta}_4\sin(\theta_3)\sin(\theta_4) -$$
$$0.5\,I_{xx,4}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2) + 0.5\,I_{yy,4}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2) - 2.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) -$$
$$2.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) -$$
$$2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) -$$
$$2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) +$$
$$2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) +$$
$$2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) -$$
$$a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2 - a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2 - a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 - a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 - a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 -$$
$$2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2 - 2\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2 - 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 - 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 -$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 + I_{xz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) -$$
$$I_{yz,4}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) - I_{yz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) -$$
$$I_{yz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_4\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) -$$
$$I_{yz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - 0.25\,{a_4}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - {a_4}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) -$$
$$0.25\,{a_4}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - {a_4}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) -$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + 8\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 - I_{xz,4}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) - I_{xz,4}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) -$$
$$I_{xz,5}\,\dot{\theta}_3\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_3\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_3\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\,\dot{\theta}_4\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) -$$
$$I_{xz,5}\,\dot{\theta}_4\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_4\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\,\dot{\theta}_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) -$$
$$I_{xz,5}\,\dot{\theta}_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + {\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - {\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) +$$
$$\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - {\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + {\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - {\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) +$$
$$\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - {\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + {\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + I_{yz,4}\,\dot{\theta}_1\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) +$$
$$I_{yz,5}\,\dot{\theta}_3\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_4\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + 0.5\,I_{xx,4}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_2) -$$
$$0.5\,I_{yy,4}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_2) + 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos(\theta_2) - 0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2) -$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\sin(\theta_4) - 0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\sin(\theta_4) - I_{xy,4}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2) - I_{xy,4}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\cos(\theta_2) -$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\sin(\theta_4) + 2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) -$$
$$2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) +$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) -$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$

$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)+I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_5\right)\,\cos\left(\theta_2\right)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_5\right)\,\sin\left(\theta_2\right)+4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$4\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+4\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-a_2\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-$$
$$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$

$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_4\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+$$
$$0.5\,{a_4}^2\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+2.0\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+2.0\,{a_4}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\sin\left(\theta_3\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$${a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-{a_5}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)-{a_5}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_4\right)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$$
$$a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2-a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$

$a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)-\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-$
$8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$
$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-$
$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$
$\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$
$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)-a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)+$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-$
$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$
$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$
$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$

$$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) -$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) - 4\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) - 4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) - 4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) +$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) +$$
$$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) + a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) +$$
$$a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) - a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) -$$
$$a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5) - a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) -$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) +$$
$$a_5{}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$4.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) + 4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4) + 8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) + 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) \tag{A36}$$

$$C_{25} = 2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2 - I_{xy,5}\,\dot{\theta}_2 + 2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2 + 2\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_5)^2 + 0.5\,I_{zz,5}\,\dot{\theta}_1\cos(\theta_2) + 0.5\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2 +$$
$$lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2 - 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2 + 0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) +$$
$$I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + I_{xx,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) -$$
$$I_{yy,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) + 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) -$$
$$2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) +$$
$$2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 - a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 -$$
$$a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 - 2.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 - 2.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 - 2.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 +$$
$$I_{xz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + I_{xz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) - I_{yz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) -$$
$$I_{yz,5}\,\dot{\theta}_3\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_4\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) -$$
$$I_{yz,5}\,\dot{\theta}_4\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) - I_{yz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) - I_{yz,5}\,\dot{\theta}_5\cos(\theta_3)\cos(\theta_5)\sin(\theta_4) - I_{yz,5}\,\dot{\theta}_5\cos(\theta_4)\cos(\theta_5)\sin(\theta_3) -$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 0.25\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + 8\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$I_{xz,5}\,\dot{\theta}_3\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_3\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_3\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\,\dot{\theta}_4\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) -$$
$$I_{xz,5}\,\dot{\theta}_4\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_4\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - I_{xz,5}\,\dot{\theta}_5\cos(\theta_3)\sin(\theta_4)\sin(\theta_5) - I_{xz,5}\,\dot{\theta}_5\cos(\theta_4)\sin(\theta_3)\sin(\theta_5) -$$
$$I_{xz,5}\,\dot{\theta}_5\cos(\theta_5)\sin(\theta_3)\sin(\theta_4) - {lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + {lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - {lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) +$$
$${lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - {lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + {lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_3\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) +$$
$$I_{yz,5}\,\dot{\theta}_4\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_5\sin(\theta_3)\sin(\theta_4)\sin(\theta_5) - 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_5) + 0.5\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2) -$$
$$0.5\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_5) + 0.5\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_2\sin(\theta_5) + 2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) +$$
$$2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) -$$
$$2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) + 2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) +$$
$$2.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) - 2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) -$$
$$2.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 4.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3) + 4.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$4.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 4.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3) - 4.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$4.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2) + 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2) -$$
$$0.25\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)\cos(\theta_2) + 0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_2) - 0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\sin(\theta_5)\cos(\theta_2) + I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2) +$$
$$I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2) + I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2) + 0.25\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_2) -$$
$$0.25\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\sin(\theta_5)\cos(\theta_2) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2) +$$
$$0.5\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2) -$$
$$0.5\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2) +$$
$$2.0\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 + 2.0\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$0.25\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\sin(\theta_5)\sin(\theta_2) + 4.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 + 4.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2 +$$
$$4.0\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2 - I_{xy,5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2) - I_{xz,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2) +$$
$$4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4) + 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5) + 4\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5) +$$
$$I_{yz,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5) + I_{yz,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4) + I_{yz,5}\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3) +$$

$I_{xz,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+I_{xz,5}\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)-I_{yz,5}\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)-$
$0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_5)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)-0.25\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_5)-$
$0.25\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)-a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)+0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_4)-$
$a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)-a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_5)+$
$0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)+2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$
$2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$
$2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$a_5{}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$
$0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-4.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$
$4.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-4.0\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$
$4.0\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$
$0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$
$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$
$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-a_2\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-lc_{5,1}\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$
$lc_{5,1}\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-lc_{5,1}\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-$
$0.5\,a_3\,lc_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-a_2\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-a_2\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$
$a_2\,lc_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$
$lc_{5,2}\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-4.0\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+0.5\,a_3\,lc_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$
$a_2\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+a_2\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+a_2\,lc_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$
$0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,lc_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$

$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_3\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_4\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_5\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4) - 8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) -$
$8\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5) -$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5) - 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) -$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) - 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) -$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) + 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) +$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) + 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) + 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) +$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) +$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) -$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) -$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3) - 4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4) -$
$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5) - 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) -$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$
$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) - 4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$
$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) -$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) +$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$
$a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) - a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) +$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) -$
$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) -$
$a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) - 2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) -$
$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) - 4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) -$
$\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) - \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) - 4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5) -$
$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5) + a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) -$
$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) -$
$\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) - \mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) +$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) + 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) +$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) + \mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) +$

$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right) \tag{A37}$$

$$C_{31} = -0.5\,I_{xy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_3) - 0.25\,I_{xx,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_3) + 0.25\,I_{yy,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_3) - 0.5\,I_{zz,3}\,\dot{\theta}_2\,\cos(\theta_2) -$$
$$0.5\,I_{zz,4}\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,I_{zz,5}\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,I_{xy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3) - 0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) -$$
$$0.25\,I_{xx,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) - 0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) +$$
$$0.25\,I_{yy,3}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) +$$
$$0.5\,I_{xy,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.5\,I_{xx,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,I_{yy,3}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 1.0\,I_{xy,3}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.5\,I_{xz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3) + 0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3) + 0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3) + 0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3) +$$
$$0.5\,I_{yz,3}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3) + 0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3) - 0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3) - 0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2) -$$
$$0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2) - 0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2) - 0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2) +$$
$$1.0\,I_{yz,3}\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2) - 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(\theta_2) -$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_2) + 1.0\,I_{xz,3}\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3) + 0.5\,I_{xx,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,I_{yy,4}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.25\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) - 0.25\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) +$$
$$0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) - 0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.125\,{a_3}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,{a_3}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) +$$
$$0.5\,{a_3}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,I_{xz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4) + 0.5\,{\mathrm{lc}_{3,1}}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.5\,{\mathrm{lc}_{3,2}}^2\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,I_{yz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4) + 0.5\,I_{yz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3) +$$
$$0.5\,I_{xz,4}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) + 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5) +$$
$$0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3) + 0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_3) - 0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$
$$0.25\,I_{xx,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) +$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) + 0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.25\,I_{yy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) -$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) - 0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) - 0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) +$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_3) + 0.5\,I_{xy,4}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) - 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.25\,I_{xx,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) +$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 1.0\,I_{yz,4}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2) + 1.0\,I_{xz,4}\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) +$$
$$1.0\,I_{xz,4}\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) - 1.0\,I_{yz,4}\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.25\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_3) - 0.5\,a_2\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_3) -$$
$$0.5\,a_2\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_3) - 0.5\,I_{xx,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,I_{yy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_3) - 0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2) +$$
$$1.0\,I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 1.0\,I_{xy,4}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(\theta_3) +$$
$$0.0625\,{a_3}^2\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.25\,{a_3}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.25\,{a_3}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) +$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) +$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) + 0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3) + 0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4) +$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) + 0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) +$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) - 0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5) -$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4) - 0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3) +$$
$$0.25\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3) + 0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4) + 0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3) -$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5) - 0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5) -$$
$$0.5\,I_{xy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) - 0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4) -$$

$$0.25\,I_{xx,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,I_{yy,5}\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.25\,a_2\,a_3\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+0.5\,a_2\,a_3\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+$$
$$0.5\,a_2\,a_3\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)+0.5\,a_3\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.5\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)-0.5\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+0.25\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-1.0\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)+$$
$$0.5\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)-0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(\theta_4)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.5\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)+$$
$$1.0\,I_{xy,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+1.0\,I_{xz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-1.0\,I_{xz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,I_{xz,5}\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,I_{xz,5}\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)-1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+1.0\,I_{yz,5}\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)-1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.5\,a_1\,a_3\,m_3\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)+1.0\,a_1\,a_3\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)+1.0\,a_1\,a_3\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-0.5\,a_2\,a_3\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,a_2\,a_3\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)-1.0\,a_2\,a_3\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+1.0\,a_1\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)-$$
$$1.0\,a_2\,\mathrm{lc}_{3,1}\,m_3\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)+1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)+$$
$$1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)+0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)+1.0\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)-1.0\,\mathrm{lc}_{3,2}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)-1.0\,a_1\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)+1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_5)-0.125\,{a_4}^2\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$

$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-1.0\,\mathrm{lc}_{3,1}\,\mathrm{lc}_{3,3}\,m_3\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)+0.25\,a_3\,\mathrm{lc}_{3,2}\,m_3\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+$$
$$1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-$$
$$0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+1.0\,a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+$$
$$1.0\,a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+$$

$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-1.0\,a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$1.0\,a_1\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)+1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-$$
$$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$$

$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) - 0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - 0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) +$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) +$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) + 0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + 0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) -$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) - 0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) -$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) +$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) - 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) +$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - 0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) -$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) - 0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) + 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) -$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - 1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) - 1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) -$$
$$1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) + 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) + 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) +$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) + 1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) -$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) + 1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) -$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) - 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$

$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right) \tag{A38}$$

$$C_{32} = 1.0\, I_{xy,3}\, \dot{\theta}_2 \cos(2.0\,\theta_3) + 0.5\, I_{xx,3}\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.5\, I_{yy,3}\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.5\, I_{zz,3}\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, I_{zz,4}\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, I_{zz,5}\, \dot{\theta}_1 \cos(\theta_2) + 1.0\, I_{xy,4}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) + 0.5\, I_{xx,4}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.5\, I_{xx,4}\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 0.5\, I_{yy,4}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.5\, I_{yy,4}\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 1.0\, I_{xy,4}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.5\, I_{xx,3}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) + 0.5\, I_{yy,3}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) + 1.0\, I_{xy,3}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) - 0.125\, {a_3}^2\, m_3\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.5\, {a_3}^2\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.5\, {a_3}^2\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.5\, {\mathrm{lc}_{3,1}}^2\, m_3\, \dot{\theta}_2 \sin(2.0\,\theta_3) + 0.5\, {\mathrm{lc}_{3,2}}^2\, m_3\, \dot{\theta}_2 \sin(2.0\,\theta_3) - 0.125\, {a_3}^2\, m_3\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {a_3}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {a_3}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {a_4}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) - 0.125\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) + 1.0\, I_{yz,3}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_2) - 0.5\, {\mathrm{lc}_{3,1}}^2\, m_3\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{3,2}}^2\, m_3\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) + 1.0\, I_{xz,3}\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) + 0.5\, I_{xx,4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 0.5\, I_{yy,4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 0.5\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.5\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.5\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.5\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.125\, {a_3}^2\, m_3\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) + 0.5\, {a_3}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) + 0.5\, {a_3}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) + 0.5\, {\mathrm{lc}_{3,1}}^2\, m_3\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) - 0.5\, {\mathrm{lc}_{3,2}}^2\, m_3\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) - 1.0\, I_{xy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) - 0.5\, a_3\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_2 \cos(2.0\,\theta_3) - 1.0\, \mathrm{lc}_{3,1}\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_2 \cos(2.0\,\theta_3) - 0.5\, I_{xx,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) - 0.5\, I_{xx,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) - 0.5\, I_{xx,5}\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) + 0.5\, I_{yy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) + 0.5\, I_{yy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.5\, I_{yy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 0.5\, a_3\, \mathrm{lc}_{3,1}\, m_3\, \dot{\theta}_2 \sin(2.0\,\theta_3) + 1.0\, I_{xy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) + 1.0\, I_{xy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) + 1.0\, I_{xy,5}\, \dot{\theta}_2 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.5\, I_{xx,5}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) - 0.5\, I_{yy,5}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) + 1.0\, I_{yz,4}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \sin(\theta_2) + 1.0\, I_{xz,4}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_2) \sin(\theta_4) + 1.0\, I_{xz,4}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_2) \sin(\theta_3) - 1.0\, I_{yz,4}\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) \sin(\theta_4) - 0.5\, a_2\, a_3\, m_3\, \dot{\theta}_2 \cos(\theta_3) - 1.0\, a_2\, a_3\, m_4\, \dot{\theta}_2 \cos(\theta_3) - 1.0\, a_2\, a_3\, m_5\, \dot{\theta}_2 \cos(\theta_3) - 0.5\, I_{xx,4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) + 0.5\, I_{yy,4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) - 0.5\, a_3\, \mathrm{lc}_{3,1}\, m_3\, \dot{\theta}_1 \cos(\theta_2) - 1.0\, a_2\, \mathrm{lc}_{3,1}\, m_3\, \dot{\theta}_2 \cos(\theta_3) - 0.5\, a_4\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, a_5\, \mathrm{lc}_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) + 1.0\, I_{xy,4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + 1.0\, I_{xy,4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \cos(\theta_2) + 1.0\, a_2\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_2 \sin(\theta_3) - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 0.5\, {a_4}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.5\, {a_4}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 1.0\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) - 0.5\, a_4\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.5\, a_4\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.5\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) + 1.0\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.5\, I_{xx,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) - 0.5\, I_{yy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) + 0.5\, a_3\, \mathrm{lc}_{3,1}\, m_3\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) - 1.0\, a_3\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(\theta_4) - 0.5\, a_3\, a_4\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(\theta_4) - 0.5\, a_3\, a_4\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) - 1.0\, a_3\, a_4\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(\theta_4) - 1.0\, a_3\, a_4\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) - 1.0\, I_{xy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) - 1.0\, I_{xy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) \cos(\theta_2) - 1.0\, I_{xy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \cos(\theta_2) - 0.5\, a_3\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) - 1.0\, a_3\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(\theta_4) - 1.0\, a_3\, \mathrm{lc}_{4,1}\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) + 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) + 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 1.0\, \mathrm{lc}_{3,1}\, \mathrm{lc}_{3,2}\, m_3\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) - 0.5\, I_{xx,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) - 0.5\, I_{xx,5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) \cos(\theta_2) - 0.5\, I_{xx,5}\, \dot{\theta}_1 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + 0.5\, I_{yy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) + 0.5\, I_{yy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) \cos(\theta_2) + 0.5\, I_{yy,5}\, \dot{\theta}_1 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + 1.0\, a_3\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(\theta_4) + 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) + 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) + 1.0\, I_{xy,5}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) + 1.0\, I_{xz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \cos(\theta_5) \sin(\theta_2) - 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) - 1.0\, I_{yz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \sin(\theta_2) \sin(\theta_5) -$$

$$1.0\, I_{yz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5) \sin(\theta_2) \sin(\theta_4) - 1.0\, I_{yz,5}\, \dot{\theta}_1 \cos(\theta_4) \cos(\theta_5) \sin(\theta_2) \sin(\theta_3) - 0.5\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) +$$
$$0.5\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) - 1.0\, I_{xz,5}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_2) \sin(\theta_4) \sin(\theta_5) - 1.0\, I_{xz,5}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_2) \sin(\theta_3) \sin(\theta_5) -$$
$$1.0\, I_{xz,5}\, \dot{\theta}_1 \cos(\theta_5) \sin(\theta_2) \sin(\theta_3) \sin(\theta_4) - 0.5\, a_3\, a_4\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) - 0.5\, a_2\, a_4\, m_4\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) -$$
$$1.0\, a_3\, a_4\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) - 1.0\, a_2\, a_4\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) + 1.0\, I_{yz,5}\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) \sin(\theta_4) \sin(\theta_5) -$$
$$1.0\, a_2\, lc_{3,2}\, m_3\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) - 1.0\, a_3\, lc_{4,1}\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) - 1.0\, a_2\, lc_{4,1}\, m_4\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) + 1.0\, a_4\, lc_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5) -$$
$$0.5\, a_2\, a_3\, m_3\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_3) - 1.0\, a_2\, a_3\, m_4\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_3) - 1.0\, a_2\, a_3\, m_5\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_3) + 0.5\, a_4\, a_5\, m_5\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_5) +$$
$$0.125\, {a_4}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) + 0.5\, {a_4}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) - 1.0\, a_2\, lc_{3,1}\, m_3\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_3) +$$
$$1.0\, a_3\, lc_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_4) + 1.0\, a_2\, lc_{4,2}\, m_4\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_4) + 1.0\, a_2\, lc_{4,2}\, m_4\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_3) + 1.0\, a_4\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_5) +$$
$$0.5\, a_2\, a_4\, m_4\, \dot{\theta}_2 \sin(\theta_3) \sin(\theta_4) + 1.0\, a_2\, a_4\, m_5\, \dot{\theta}_2 \sin(\theta_3) \sin(\theta_4) + 0.5\, {lc_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) -$$
$$0.5\, {lc_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2) - 1.0\, lc_{3,2}\, lc_{3,3}\, m_3\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_2) - 0.5\, a_3\, lc_{3,3}\, m_3\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) +$$
$$1.0\, a_2\, lc_{4,1}\, m_4\, \dot{\theta}_2 \sin(\theta_3) \sin(\theta_4) - 1.0\, a_3\, lc_{4,3}\, m_4\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) - 1.0\, a_3\, lc_{5,3}\, m_5\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) -$$
$$0.5\, {a_4}^2\, m_5\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 1.0\, lc_{3,1}\, lc_{3,3}\, m_3\, \dot{\theta}_1 \sin(\theta_2) \sin(\theta_3) - 0.5\, {lc_{4,1}}^2\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) +$$
$$0.5\, {lc_{4,2}}^2\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 0.5\, a_4\, lc_{4,2}\, m_4\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) - 1.0\, a_4\, lc_{5,2}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(\theta_5) +$$
$$0.5\, a_3\, a_4\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) \cos(\theta_4) + 1.0\, a_3\, a_4\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) \cos(\theta_4) - 0.5\, a_3\, a_5\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(\theta_4) \cos(\theta_5) +$$
$$1.0\, a_3\, lc_{4,1}\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) \cos(\theta_4) - 1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(\theta_4) \cos(\theta_5) - 0.125\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) -$$
$$1.0\, a_3\, lc_{4,2}\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(\theta_2) \sin(\theta_4) - 1.0\, a_3\, lc_{4,2}\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) \cos(\theta_4) + 1.0\, a_3\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(\theta_4) \sin(\theta_5) +$$
$$1.0\, a_3\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(\theta_5) \sin(\theta_4) + 1.0\, a_3\, lc_{5,2}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) \cos(\theta_5) - 0.5\, a_3\, a_4\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) \sin(\theta_4) -$$
$$1.0\, a_3\, a_4\, m_5\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) \sin(\theta_4) + 0.5\, a_3\, a_5\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(\theta_4) \sin(\theta_5) + 0.5\, a_3\, a_5\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) \sin(\theta_5) +$$
$$0.5\, a_3\, a_5\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_5) \sin(\theta_4) - 0.5\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) + 0.5\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \cos(\theta_2) -$$
$$1.0\, a_3\, lc_{4,1}\, m_4\, \dot{\theta}_1 \sin(2.0\,\theta_3) \cos(\theta_2) \sin(\theta_4) + 1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(\theta_4) \sin(\theta_5) + 1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_4) \sin(\theta_5) +$$
$$1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \cos(\theta_5) \sin(\theta_4) + 0.125\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) + 0.125\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) \cos(\theta_2) +$$
$$0.125\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 1.0\, a_3\, lc_{5,2}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(\theta_4) \sin(\theta_5) + 0.5\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) +$$
$$0.5\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) \cos(\theta_2) + 0.5\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) -$$
$$0.5\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) \cos(\theta_2) - 0.5\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) \cos(\theta_2) -$$
$$0.5\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) + 0.5\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) +$$
$$1.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) + 0.5\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) +$$
$$0.5\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.5\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) - 0.5\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) -$$
$$0.5\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) - 0.5\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) - 1.0\, a_2\, lc_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) \cos(\theta_4) +$$
$$1.0\, a_3\, lc_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \cos(\theta_5) + 1.0\, a_2\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) \cos(\theta_5) - 0.5\, a_2\, a_4\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) \sin(\theta_4) -$$
$$0.5\, a_2\, a_4\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_3) - 1.0\, a_2\, a_4\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) \sin(\theta_4) - 1.0\, a_2\, a_4\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_3) +$$
$$0.5\, a_3\, a_5\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_5) + 0.5\, a_3\, a_5\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5) \sin(\theta_4) + 0.5\, a_2\, a_5\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) \sin(\theta_5) +$$
$$0.5\, a_2\, a_5\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5) \sin(\theta_4) + 0.5\, a_2\, a_5\, m_5\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5) \sin(\theta_3) - 1.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) -$$
$$1.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \sin(2.0\,\theta_5) - 1.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) -$$
$$0.5\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) - 1.0\, a_2\, lc_{4,1}\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) \sin(\theta_4) - 1.0\, a_2\, lc_{4,1}\, m_4\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_3) +$$
$$1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_5) + 1.0\, a_3\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5) \sin(\theta_4) + 1.0\, a_2\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) \sin(\theta_5) +$$
$$1.0\, a_2\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5) \sin(\theta_4) + 1.0\, a_2\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5) \sin(\theta_3) - 1.0\, lc_{4,2}\, lc_{4,3}\, m_4\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \sin(\theta_2) +$$

$$1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - 0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - 1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4) - 1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) + 1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5) - 0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) -$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) +$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) +$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) - 1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - 1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(\theta_5) +$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) -$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5) +$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) -$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) + 0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2) - 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) -$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) + 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) +$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) + 1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) +$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + 0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) -$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2) - 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) +$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) + 1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) +$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) + 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) + 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3) -$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) +$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) -$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) -$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) - 1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) -$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) -$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) +$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5) +$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5) \tag{A39}$$

$$C_{33} = a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_4) - 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_4) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_5) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_4) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_5) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) \tag{A40}$$

$$C_{34} = 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_4\,\cos(\theta_4) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_4) - 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_4\,\sin(\theta_4) - 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_4) - 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_4\,\sin(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_4\,\sin(\theta_4) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4) + 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) \tag{A41}$$

$$C_{35} = 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\cos(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)\,\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos(\theta_5)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) - 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) \tag{A42}$$

$$
\begin{aligned}
C_{41} \;=\; & -0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 - 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 - 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 + 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 - 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 + \\
& 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 + 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.5\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_5)^2 - 0.5\, I_{\mathrm{zz},4}\, \dot{\theta}_2 \cos(\theta_2) - \\
& 0.5\, I_{\mathrm{zz},5}\, \dot{\theta}_2 \cos(\theta_2) + 0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) + 0.125\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 + 0.125\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 + 0.25\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 + \\
& 0.25\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 + 0.125\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.125\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 0.125\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - \\
& 0.125\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) - 0.25\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) + 1.0\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2 + 1.0\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2 + \\
& 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3)^2 - 1.0\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2 + 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4)^2 + 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5)^2 - \\
& 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4)^2 - 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5)^2 - 1.0\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5)^2 - 0.125\, {a_4}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) - \\
& 0.5\, {a_4}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.125\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) - 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) + \\
& 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) + 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) + 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) + 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) + \\
& 0.25\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_5) \sin(\theta_5) + 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) + 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \sin(\theta_2) - 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) - \\
& 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \sin(\theta_3) - 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) - 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4) \sin(\theta_4) - 0.25\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_5) \sin(\theta_5) - \\
& 0.5\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) - 0.5\, {\mathrm{lc}_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_2) + 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_2 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2) - 0.125\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) - 0.125\, {\mathrm{lc}_{4,1}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + \\
& 0.125\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) + 0.125\, {\mathrm{lc}_{4,2}}^2\, m_4\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) + 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) + \\
& 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) + \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) - 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \\
& 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
& 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) - \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \sin(\theta_2) - \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \sin(\theta_2) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_3) \sin(\theta_3) + 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \\
& 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 \sin(\theta_2) + 0.5\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_4) \sin(\theta_4) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_2)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
& 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(\theta_2)^2 + \\
& 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 - 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_3)^2 - 0.25\, a_4\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 - \\
& 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 - 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.25\, a_5\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_5)^2 + 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_2)^2 - \\
& 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_3)^2 - 0.5\, \mathrm{lc}_{4,1}\, \mathrm{lc}_{4,2}\, m_4\, \dot{\theta}_1 \cos(\theta_4)^2 + 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_2)^2 - 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_3)^2 - \\
& 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_4)^2 - 0.5\, \mathrm{lc}_{5,1}\, \mathrm{lc}_{5,2}\, m_5\, \dot{\theta}_1 \cos(\theta_5)^2 - 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 - 0.25\, I_{\mathrm{xx},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \cos(\theta_2)^2 + \\
& 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 + 0.25\, I_{\mathrm{yy},4}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \sin(2.0\,\theta_3) \cos(\theta_2)^2 - 0.5\, I_{\mathrm{xz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_3) \cos(\theta_4) + \\
& 0.5\, I_{\mathrm{xy},4}\, \dot{\theta}_1 \sin(2.0\,\theta_3) \sin(2.0\,\theta_4) \cos(\theta_2)^2 + 0.5\, I_{\mathrm{yz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_3) \sin(\theta_4) + 0.5\, I_{\mathrm{yz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \cos(\theta_4) \sin(\theta_3) + \\
& 0.5\, I_{\mathrm{xz},4}\, \dot{\theta}_1 \sin(2.0\,\theta_2) \sin(\theta_3) \sin(\theta_4) - 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) - 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) - \\
& 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) - 0.125\, I_{\mathrm{xx},5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) + 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_4) \sin(2.0\,\theta_5) + \\
& 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \cos(2.0\,\theta_5) \sin(2.0\,\theta_4) + 0.125\, I_{\mathrm{yy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_4) \cos(2.0\,\theta_5) \sin(2.0\,\theta_3) + 0.25\, I_{\mathrm{xy},5}\, \dot{\theta}_1 \cos(2.0\,\theta_3) \sin(2.0\,\theta_4) \sin(2.0\,\theta_5) +
\end{aligned}
$$

$$0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)+0.25\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.125\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$0.125\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+1.0\,I_{\mathrm{yz},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2+$$
$$1.0\,I_{\mathrm{xz},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+1.0\,I_{\mathrm{xz},4}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yz},4}\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,I_{\mathrm{xx},4}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,I_{\mathrm{yy},4}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)+0.75\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)+$$
$$0.375\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(\theta_4\right)+0.75\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)+1.0\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+1.0\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+$$
$$0.75\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_4\right)-0.03125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.03125\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$0.125\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(1.0\,\theta_4\right)+$$
$$0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(1.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(1.0\,\theta_4\right)+0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(1.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)-0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(1.0\,\theta_4\right)+0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(1.0\,\theta_4\right)\,\sin\left(2.0\,\theta_2\right)-$$
$$0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)-0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(1.0\,\theta_4\right)+$$
$$0.125\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.25\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)+0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-1.0\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$

$$1.0\,I_{\mathrm{xx},4}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_2)-1.0\,I_{\mathrm{xx},4}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2\sin(\theta_2)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_2)-$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+1.0\,I_{\mathrm{yy},4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_2)+$$
$$1.0\,I_{\mathrm{yy},4}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_2)+1.0\,I_{\mathrm{yy},4}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2\sin(\theta_2)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_2)+$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)+$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)+1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)-$$
$$0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)-0.5\,I_{\mathrm{yz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\cos(1.0\,\theta_4)\cos(\theta_2)-$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\cos(1.0\,\theta_4)\cos(\theta_2)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\cos(1.0\,\theta_4)\cos(\theta_2)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\cos(1.0\,\theta_4)\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)-0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{xz},5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\cos(1.0\,\theta_4)\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\cos(1.0\,\theta_4)\cos(\theta_2)-$$
$$0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_4)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(1.0\,\theta_5)\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\cos(1.0\,\theta_5)\cos(\theta_2)-0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_4)-0.0625\,a_3\,a_4\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_4)+$$
$$0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(\theta_4)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)-0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_4)-$$
$$0.125\,a_3\,a_4\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_4)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(\theta_4)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(1.0\,\theta_5)\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\sin(1.0\,\theta_5)\cos(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\cos(1.0\,\theta_5)\sin(\theta_2)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\sin(1.0\,\theta_5)\cos(\theta_2)-1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)-1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2)-$$
$$1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2)-0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_4)-0.125\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_4)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(\theta_4)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(1.0\,\theta_4)\sin(\theta_2)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\sin(1.0\,\theta_4)\cos(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\cos(1.0\,\theta_4)\sin(\theta_2)+0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\sin(1.0\,\theta_4)\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(1.0\,\theta_5)\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\sin(1.0\,\theta_5)\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\cos(1.0\,\theta_5)\sin(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\sin(1.0\,\theta_5)\cos(\theta_2)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\sin(1.0\,\theta_4)\sin(\theta_2)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\sin(1.0\,\theta_4)\sin(\theta_2)-$$
$$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\sin(1.0\,\theta_4)\sin(\theta_2)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\sin(1.0\,\theta_4)\sin(\theta_2)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)-0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)+0.5\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\sin(1.0\,\theta_4)\sin(\theta_2)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\sin(1.0\,\theta_4)\sin(\theta_2)+0.125\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(\theta_4)-$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\sin(1.0\,\theta_5)\sin(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\sin(1.0\,\theta_5)\sin(\theta_2)+$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)-$$

$$0.125\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-0.125\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)-0.125\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)-$$
$$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)^2+1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)^2-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_5\right)^2+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2+$$
$$1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.03125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-$$
$$1.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-1.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+1.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+1.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$0.125\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)+0.125\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-$$
$$0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+$$
$$1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)+0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$0.125\,{a_4}^{2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.5\,{a_4}^{2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)-0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{\mathrm{lc}_{4,1}}^{2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,2}}^{2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)^2-$$
$$0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.125\,{a_4}^{2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,{a_4}^{2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2-$$
$$0.25\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,{\mathrm{lc}_{4,1}}^{2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,{\mathrm{lc}_{4,2}}^{2}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.125\,{a_4}^{2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_2\right)-0.125\,{a_4}^{2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)-$$

$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\sin\left(\theta_3\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\sin\left(\theta_2\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)-$$
$$0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\sin\left(\theta_3\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\sin\left(\theta_2\right)+0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\sin\left(\theta_3\right)+$$
$$0.125\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+0.5\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2-0.125\,a_3\,{\mathrm{lc}_{4,2}}\,m_4\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(1.0\,\theta_4\right)-$$
$$0.125\,a_4\,{\mathrm{lc}_{4,2}}\,m_4\,\dot{\theta}_1\cos\left(2.0\,\theta_3\right)\cos\left(2.0\,\theta_4\right)+0.5\,a_4\,{\mathrm{lc}_{5,2}}\,m_5\,\dot{\theta}_1\sin\left(2.0\,\theta_3\right)\sin\left(2.0\,\theta_4\right)\sin\left(\theta_5\right)-0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\sin\left(\theta_2\right)-$$
$$0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)-0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\sin\left(\theta_3\right)+0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-$$
$$0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+0.5\,a_4\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\sin\left(\theta_2\right)-$$
$$0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)-0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\sin\left(\theta_3\right)-0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+$$
$$0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+$$
$$0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+$$
$$0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.5\,a_5\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(\theta_3\right)\cos\left(\theta_4\right)+$$
$$0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(\theta_3\right)\cos\left(\theta_4\right)+0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\cos\left(2.0\,\theta_3\right)\cos\left(\theta_2\right)\cos\left(\theta_4\right)+0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\cos\left(2.0\,\theta_3\right)\cos\left(\theta_2\right)\cos\left(\theta_4\right)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(\theta_4\right)\cos\left(\theta_5\right)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos\left(2.0\,\theta_3\right)\cos\left(\theta_4\right)\cos\left(\theta_5\right)+0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+$$
$$0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)+1.0\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+$$
$$1.0\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+1.0\,{a_4}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+0.25\,a_4\,{\mathrm{lc}_{4,2}}\,m_4\,\dot{\theta}_1\cos\left(2.0\,\theta_3\right)\cos\left(2.0\,\theta_4\right)\cos\left(\theta_2\right)^2+$$
$$0.5\,a_2\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(\theta_3\right)\cos\left(\theta_4\right)+0.5\,a_3\,{\mathrm{lc}_{4,1}}\,m_4\,\dot{\theta}_2\cos\left(2.0\,\theta_3\right)\cos\left(\theta_2\right)\cos\left(\theta_4\right)-0.25\,a_3\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(2.0\,\theta_2\right)\cos\left(\theta_4\right)\cos\left(\theta_5\right)+$$
$$0.25\,a_3\,{\mathrm{lc}_{5,1}}\,m_5\,\dot{\theta}_1\cos\left(2.0\,\theta_3\right)\cos\left(\theta_4\right)\cos\left(\theta_5\right)+1.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-$$
$$1.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-$$
$$1.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_2\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)^2\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)-$$
$$1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_4\right)^2\cos\left(\theta_5\right)\sin\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)^2\sin\left(\theta_4\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^2\cos\left(\theta_3\right)^2\cos\left(\theta_4\right)\cos\left(\theta_5\right)\sin\left(\theta_5\right)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos\left(2.0\,\theta_3\right)\cos\left(2.0\,\theta_4\right)\cos\left(2.0\,\theta_5\right)\cos\left(\theta_2\right)+$$

$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_4)+0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.25\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.5\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_4)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-$$
$$0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-$$
$$1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+1.0\,a_1\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$

$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)-$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)-0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$1.0\,a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,a_1\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-0.5\,a_1\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_1\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_1\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.0625\,{a_4}^2\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,{a_4}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_2)\,\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)+0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_5)+$$
$$0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+0.125\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)+$$
$$0.25\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$

$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)^2+0.25\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$
$0.25\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)-$
$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$
$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-0.25\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-$
$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$
$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$
$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$
$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$
$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$
$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$
$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$
$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$
$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$
$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$
$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$
$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$
$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$
$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$
$0.25\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$
$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$
$1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$
$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$
$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$
$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$
$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$
$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$
$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$
$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$
$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$
$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$
$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$

$$0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+1.0\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)-$$
$$0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$

$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.25\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+$$
$$0.5\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_2)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_2)-1.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$1.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$

$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$

$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)$$

(A43)

$$C_{42} = 1.0\,I_{xy,4}\,\dot{\theta}_2 + 1.0\,I_{xy,5}\,\dot{\theta}_2 - 2.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_3)^2 - 2.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_4)^2 - 2.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2 - 2.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2 - 2.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_5)^2 - 0.5\,I_{xx,4}\,\dot{\theta}_1\cos(\theta_2) - 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2) + 0.5\,I_{yy,4}\,\dot{\theta}_1\cos(\theta_2) + 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2) - 0.5\,I_{zz,4}\,\dot{\theta}_1\cos(\theta_2) - 0.5\,I_{zz,5}\,\dot{\theta}_1\cos(\theta_2) - 0.5\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2 - 0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 - 1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2 - 1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2 + 1.0\,I_{xx,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 + 1.0\,I_{xx,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 + 1.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 + 1.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 + 1.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2 - 1.0\,I_{yy,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,I_{yy,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 1.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 1.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2 + 4.0\,I_{xy,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 + 4.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2 + 4.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)^2 + 4.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)^2 - 1.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - 1.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - 1.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 1.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 1.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) + 1.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 1.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 1.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) - 1.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2) - 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2) - 0.25\,a_4{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 0.25\,a_4{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 1.0\,a_4{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,a_4{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 0.25\,a_5{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 0.25\,a_5{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 0.25\,a_5{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2 + 2.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{xx,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) + 2.0\,I_{xx,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,I_{yy,4}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 2.0\,I_{yy,5}\,\dot{\theta}_2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 1.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 + 1.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 + 1.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 - 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 + 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2 - 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2 + 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2 + 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2 + 1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2 + 1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2 + 1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 + 1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 + 1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 + 2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)^2 + 2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4)^2 + 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2 + 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2 + 2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_5)^2 - 2.0\,I_{xx,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 - 2.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2 - 2.0\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2 + 2.0\,I_{yy,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 + 2.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2 + 2.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)^2 + 2.0\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)^2 - 2.0\,I_{xy,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3) - 2.0\,I_{xy,4}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\sin(\theta_4) - 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)\sin(\theta_5) + 1.0\,I_{yz,4}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_2) + 0.25\,a_4{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,a_4{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 0.25\,a_4{}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 0.25\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,a_4{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 0.25\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 0.25\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) - 8.0\,I_{xy,5}\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 1.0\,I_{xz,4}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_2)\sin(\theta_4) + 1.0\,I_{xz,4}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_2)\sin(\theta_3) + 1.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - 1.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 1.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) - 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3) + 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) - 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)\sin(\theta_4) + 1.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) - 1.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_5)\sin(\theta_5) - 1.0\,I_{yz,4}\,\dot{\theta}_1\sin(\theta_2)\sin(\theta_3)\sin(\theta_4) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_4) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_5) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\sin(\theta_4) + 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\sin(\theta_4) + 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\sin(\theta_4) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\sin(\theta_5) - 2.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 2.0\,\mathrm{lc}_{4,1}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 2.0\,\mathrm{lc}_{4,2}{}^2\,m_4\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 2.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) -$$

$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)+$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)-1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2-1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2-1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)^2+$$
$$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_4\right)-1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_4\right)-$$
$$1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_4\right)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_5\right)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_5\right)+0.5\,{a_4}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+$$
$$2.0\,{a_4}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)^2-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2+1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2-4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)-1.0\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)-$$
$$1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)+1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)+1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+1.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_2\,a_4\,m_4\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+1.0\,a_2\,a_4\,m_5\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{xy},4}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,{a_4}^2\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-2.0\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-$$
$$2.0\,{a_4}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_4\right)-2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_3\right)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\sin\left(\theta_5\right)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_5\right)-$$

$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)-8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+2.0\,I_{\mathrm{xx},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{yy},4}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-0.5\,a_2\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$1.0\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)-$$
$$1.0\,a_3\,a_4\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)+1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)-$$
$$1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)+1.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$2.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$$
$$1.0\,a_2\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$0.5\,a_4\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{4,2}\,\mathrm{lc}_{4,3}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)+1.0\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)-$$

$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_5)+$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_5)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)-2.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_5)-$$
$$4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-0.5\,{a_4}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$2.0\,{a_4}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)-2.0\,{\mathrm{lc}_{4,1}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+2.0\,{\mathrm{lc}_{4,2}}^2\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)-$$
$$1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-0.5\,a_3\,a_4\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)-$$
$$1.0\,a_3\,a_4\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)+$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\sin(\theta_3)\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\sin(\theta_4)\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)+$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_2)\sin(\theta_3)\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\sin(\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_4)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-2.0\,a_4\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+$$

$$2.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$$
$$4.0\,\mathrm{lc}_{4,1}\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)\,-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+2.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,a_4\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$2.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$2.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)$$

(A44)

$$C_{43} = a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_3\,\cos(\theta_4) - \frac{a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)}{2} - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) + 0.5\,a_3\,a_4\,m_4\,\dot{\theta}_3\,\sin(\theta_4) + a_3\,a_4\,m_5\,\dot{\theta}_3\,\sin(\theta_4) + a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_3\,\sin(\theta_4) + a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) + a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{4,2}\,m_4\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_5) - 1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_4) - \frac{a_3\,a_4\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)}{2} - 1.0\,a_3\,a_4\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4) - \frac{a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5)}{2} - 1.0\,a_3\,\mathrm{lc}_{4,1}\,m_4\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4) - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5) - \frac{a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)}{2} - 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5) + a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4) + 0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) \tag{A45}$$

$$C_{44} = 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - \frac{a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5)}{2} \tag{A46}$$

$$C_{45} = 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5) - 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_5\,\cos(\theta_5) - 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_5) + 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_5\,\sin(\theta_5) + 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2) + 1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2) - 1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_5) \tag{A47}$$

$$C_{51} = -0.25\,I_{xy,5}\,\dot{\theta}_1 - 0.5\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2 + 0.5\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_3)^2 + 0.5\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_4)^2 + 0.5\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_5)^2 -$$
$$0.5\,I_{zz,5}\,\dot{\theta}_2\cos(\theta_2) + 0.125\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_1 + 0.25\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_1 + 1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2 + 1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2 +$$
$$1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2 - 1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2 - 1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2 - 1.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2 -$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) - 0.25\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) + 0.25\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) + 0.25\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) +$$
$$0.25\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) + 0.25\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) - 0.25\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) - 0.25\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) -$$
$$0.25\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) - 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_2) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) +$$
$$0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) -$$
$$0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) -$$
$$0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) -$$
$$0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{xx,5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) -$$
$$0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) +$$
$$0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) +$$
$$0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,I_{yy,5}\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) + 0.25\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2 - 0.25\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2 -$$
$$0.25\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2 - 0.25\,a_5\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)^2 + 0.5\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2 - 0.5\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2 -$$
$$0.5\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2 - 0.5\,lc_{5,1}\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)^2 - 0.25\,I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5) -$$
$$0.125\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5) - 0.125\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4) - 0.125\,I_{xx,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3) +$$
$$0.125\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5) + 0.125\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4) + 0.125\,I_{yy,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3) +$$
$$0.25\,I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) + 0.25\,I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5) + 0.25\,I_{xy,5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4) +$$
$$0.125\,I_{xx,5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) - 0.125\,I_{yy,5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5) + 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) -$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) - 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) - 0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) - 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2 -$$
$$2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2 - 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2 + 2.0\,I_{xy,5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2 +$$
$$0.25\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) - 0.25\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\sin(\theta_2) - 0.25\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) + 0.25\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_3) -$$
$$0.25\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) + 0.25\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_4) - 0.25\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) + 0.25\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_5) +$$
$$0.375\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_5) - 0.5\,a_5\,lc_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_2) + 0.75\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_5) - 0.75\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\sin(\theta_5) -$$
$$0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) +$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\sin(\theta_2) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) + 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\sin(\theta_2) +$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\sin(\theta_3) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) +$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_5)^2\sin(\theta_2) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) -$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_3) + 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\sin(\theta_4) - 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) -$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_3) - 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_4) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) +$$
$$0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)\sin(\theta_5) + 0.5\,{lc_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) -$$
$$0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4) - 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5) - 0.5\,{lc_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5) +$$
$$0.125\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(1.0\,\theta_5) - 0.125\,a_4\,lc_{5,2}\,m_5\,\dot{\theta}_1\cos(1.0\,\theta_5)\sin(2.0\,\theta_2) - 0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(1.0\,\theta_5) -$$
$$0.125\,a_4\,lc_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\sin(1.0\,\theta_5) + 0.5\,I_{yz,5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5) + 0.5\,I_{xz,5}\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5) +$$

$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\sin(\theta_2)-$$
$$1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)^2\,\sin(\theta_2)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)-$$
$$1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+1.0\,I_{xx,5}\,\dot{\theta}_1\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\sin(\theta_2)+$$
$$1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_2)+$$
$$1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_2)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-1.0\,I_{yy,5}\,\dot{\theta}_1\,\cos(\theta_3)^2\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,I_{yz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)+$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{xz,5}\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(1.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(1.0\,\theta_5)\,\cos(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos(1.0\,\theta_5)\,\cos(\theta_2)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(1.0\,\theta_5)\,\cos(\theta_2)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\sin(1.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\sin(1.0\,\theta_5)\,\cos(\theta_2)-1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-1.0\,I_{xy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(1.0\,\theta_5)\,\cos(\theta_2)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(1.0\,\theta_5)\,\cos(\theta_2)+0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(\theta_5)+0.125\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\cos(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(1.0\,\theta_5)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\sin(1.0\,\theta_5)\,\cos(\theta_2)+0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+$$
$$0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-0.5\,I_{xx,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)+$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$0.5\,I_{yy,5}\,\dot{\theta}_2\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2+0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_2)\,\sin(\theta_5)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(1.0\,\theta_5)\,\sin(\theta_2)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(1.0\,\theta_5)\,\sin(\theta_2)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(1.0\,\theta_5)\,\sin(\theta_2)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$
$$0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)+0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-$$
$$0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)-0.125\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_5)^2+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_5)^2+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)^2\cos(\theta_5)^2+1.0\,I_{xy,5}\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)+$$
$$1.0\,I_{xz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.03125\,{a_5}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)-1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,I_{xy,5}\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-$$
$$1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,I_{yz,5}\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-0.125\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)+$$

$$0.125\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_3\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}+$$
$$1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\cos\left(\theta_5\right)+0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.125\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^{2}+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,{\cos\left(\theta_2\right)}^{2}-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^{2}-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,{\cos\left(\theta_2\right)}^{2}+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.75\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.375\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}-0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,{\cos\left(\theta_2\right)}^{2}-$$
$$0.75\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,{\cos\left(\theta_2\right)}^{2}-$$
$$0.0625\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(1.0\,\theta_5\right)-0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,\sin\left(\theta_2\right)-0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_2\right)-$$
$$0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_3\right)-$$
$$0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)+0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.125\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}-0.125\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(1.0\,\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,\sin\left(\theta_2\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_2\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,\sin\left(\theta_3\right)-0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_3\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_2\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_3\right)+$$
$$0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)+0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)-0.25\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_2\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_2\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)-1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_2\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_3\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)-1.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^{2}\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_3\right)+$$
$$1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^{2}\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^{2}\,\sin\left(\theta_4\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,{\cos\left(\theta_3\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^{2}\,{\cos\left(\theta_4\right)}^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-$$

$$1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_5)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)-$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_4)\sin(\theta_5)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_5)\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(\theta_4)\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(\theta_5)\sin(\theta_4)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)\cos(\theta_5)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_4)\sin(\theta_5)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(\theta_4)\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_5)\sin(\theta_4)-$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)+0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2)\sin(\theta_2)+$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2)\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_4)\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(\theta_4)\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_4)\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\cos(\theta_5)\sin(\theta_4)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)+0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)+$$
$$0.125\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+$$
$$0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+0.25\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)\sin(\theta_2)-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)-0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)-$$
$$0.25\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)\sin(\theta_2)+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)+0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)+$$
$$0.5\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)-$$
$$0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)\cos(\theta_2)-0.5\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_2)-$$
$$0.5\,I_{\mathrm{xy},5}\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)+0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)+$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_2)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_2)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_3)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_4)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_5)+0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)+$$
$$0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)+0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)-0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)-$$
$$0.125\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)+0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)+$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_2)\cos(\theta_5)\sin(\theta_4)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)-0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(2.0\,\theta_5)-$$
$$0.25\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)-0.125\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)+0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_2)\cos(\theta_5)\sin(\theta_4)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\cos(\theta_4)\cos(\theta_5)\sin(\theta_2)-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2-0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2)^2-$$
$$0.0625\,{a_5}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2)^2+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+$$

$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)-0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_2)\sin(\theta_4)\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_4)\sin(\theta_2)\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\cos(\theta_5)\sin(\theta_2)\sin(\theta_4)-0.25\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2-$$
$$0.25\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2)^2-0.25\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2)^2+$$
$$0.25\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2+0.25\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_5)\sin(2.0\,\theta_4)\cos(\theta_2)^2+$$
$$0.25\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\sin(2.0\,\theta_3)\cos(\theta_2)^2-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\sin(\theta_2)\sin(\theta_4)\sin(\theta_5)+$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+0.0625\,a_5{}^2\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\sin(\theta_2)\sin(\theta_3)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_5)^2\sin(\theta_2)\sin(\theta_3)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\sin(\theta_2)\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\sin(\theta_3)\sin(\theta_4)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_2)\sin(\theta_4)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_5)\sin(\theta_2)\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_2)\sin(\theta_5)+2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-2.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(\theta_5)+0.25\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2-$$
$$0.25\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(2.0\,\theta_5)\cos(\theta_2)^2-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\sin(\theta_5)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\cos(\theta_5)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\sin(2.0\,\theta_4)\sin(\theta_5)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_4)\sin(2.0\,\theta_3)\sin(\theta_5)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_3)\sin(2.0\,\theta_4)\cos(\theta_5)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)^2\sin(\theta_2)\sin(\theta_3)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_2)\sin(\theta_4)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_2)\sin(\theta_5)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)^2\sin(\theta_3)\sin(\theta_4)-4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)\cos(\theta_4)^2\cos(\theta_5)\sin(\theta_3)\sin(\theta_5)-$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)\cos(\theta_5)\sin(\theta_4)\sin(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)-$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)-0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)-$$
$$0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_5)\sin(\theta_4)-0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\sin(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)-$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)-0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)-0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_5)\sin(\theta_4)-$$
$$0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\sin(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\cos(\theta_5)+0.0625\,a_5{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2)\sin(\theta_2)-$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\cos(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_3)\sin(\theta_4)\sin(\theta_5)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_4)\sin(\theta_3)\sin(\theta_5)+0.5\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\cos(\theta_5)\sin(\theta_3)\sin(\theta_4)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(2.0\,\theta_3)\cos(\theta_2)\sin(\theta_4)\sin(\theta_5)+0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\sin(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_4)\sin(\theta_5)+$$
$$0.5\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\sin(2.0\,\theta_3)\cos(\theta_2)\cos(\theta_5)\sin(\theta_4)-0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_4)\sin(\theta_5)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_3)\cos(\theta_5)\sin(\theta_4)-0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\sin(2.0\,\theta_2)\cos(\theta_4)\cos(\theta_5)\sin(\theta_3)+$$
$$0.25\,a_2\,a_5\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_2)\sin(\theta_3)\sin(\theta_4)\sin(\theta_5)+0.25\,a_3\,a_5\,m_5\,\dot{\theta}_2\sin(2.0\,\theta_3)\cos(\theta_2)\sin(\theta_4)\sin(\theta_5)+0.25\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_1\cos(2.0\,\theta_3)\cos(2.0\,\theta_4)\cos(2.0\,\theta_5)\cos(\theta_2$$

$$0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\,\sin\left(\theta_3\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)\,+\,0.5\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)\,+$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-0.0625\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.0625\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.0625\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)+1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.125\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)-$$
$$0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)-0.5\,{a_5}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(\theta_5\right)-0.25\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_5\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)-1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_2\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^{2}\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_3\right)-2.0\,{\mathrm{lc}_{5,1}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^{2}\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,2}}^{2}\,m_5\,\dot{\theta}_1\cos\left(\theta_2\right)^{2}\cos\left(\theta_3\right)^{2}\cos\left(\theta_4\right)^{2}\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)+$$
$$0.25\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_2\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)-$$

$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)-$$
$$1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_3)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,a_1\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_1\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$1.0\,a_1\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_2\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)^2-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)-0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\cos(\theta_5)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.125\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\cos(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$0.25\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\cos(\theta_5)+$$
$$0.25\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_4)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_5)\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)^2+$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\sin(2.0\,\theta_5)\,\cos(\theta_2)^2+0.25\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_2)\,\sin(2.0\,\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(2.0\,\theta_3)\,\sin(2.0\,\theta_4)\,\cos(\theta_2)\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\cos(\theta_2)^2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(2.0\,\theta_3)\,\cos(2.0\,\theta_4)\,\cos(2.0\,\theta_5)\,\cos(\theta_2)\,\sin(\theta_2)-$$

$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.25\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-$$
$$0.25\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(2.0\,\theta_5\right)\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+0.25\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)+$$
$$0.5\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin\left(2.0\,\theta_3\right)\,\sin\left(2.0\,\theta_4\right)\,\sin\left(2.0\,\theta_5\right)\,\cos\left(\theta_2\right)\,\sin\left(\theta_2\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_4\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)^2\,\cos\left(\theta_3\right)^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)-1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$

$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,{\cos\left(\theta_5\right)}^2\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,{\cos\left(\theta_4\right)}^2\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_5\right)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,{\cos\left(\theta_3\right)}^2\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,{\cos\left(\theta_2\right)}^2\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)-4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos\left(\theta_2\right)\,\cos\left(\theta_3\right)\,\cos\left(\theta_4\right)\,\cos\left(\theta_5\right)\,\sin\left(\theta_2\right)\,\sin\left(\theta_3\right)\,\sin\left(\theta_4\right)\,\sin\left(\theta_5\right)$$

(A48)

$$
\begin{aligned}
C_{52} = {} & 1.0\, I_{xy,5}\, \dot{\theta}_2 - 2.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 - 2.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_4)^2 - 2.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_5)^2 - 0.5\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) + \\
& 0.5\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, I_{zz,5}\, \dot{\theta}_1 \cos(\theta_2) - 0.5\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 - 1.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 + 1.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 + \\
& 1.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 + 1.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 - 1.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 - 1.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 - \\
& 1.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 + 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 + 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5)^2 + 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5)^2 - \\
& 1.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_3) - 1.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_4) - 1.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_5) \sin(\theta_5) + 1.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_3) + \\
& 1.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_4) + 1.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_5) \sin(\theta_5) - 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) - 0.25\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 - \\
& 0.25\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 - 0.25\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 + 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + \\
& 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + \\
& 2.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - \\
& 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - \\
& 2.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) - 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 - 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 + \\
& 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 - 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 + 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 + 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 + \\
& 1.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 + 1.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 + 1.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_5)^2 + 2.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 + \\
& 2.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 + 2.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_5)^2 - 2.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 - 2.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 - \\
& 2.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 + 2.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 + 2.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 + \\
& 2.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 - 2.0\, I_{xy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3) \sin(\theta_3) - 2.0\, I_{xy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4) \sin(\theta_4) - \\
& 2.0\, I_{xy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5) \sin(\theta_5) + 0.25\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_3) + 0.25\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_4) + 0.25\, {a_5}^2\, m_5\, \dot{\theta}_2 \cos(\theta_5) \sin(\theta_5) - \\
& 8.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5)^2 + 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_3) - 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \sin(\theta_3) + 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_4) - \\
& 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4) \sin(\theta_4) + 1.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_5) \sin(\theta_5) - 1.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_5) \sin(\theta_5) - 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) - \\
& 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) - 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) + 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \sin(\theta_3) + \\
& 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5)^2 \sin(\theta_3) + 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \sin(\theta_4) - 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
& 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) - 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
& 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) \sin(\theta_5) + 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 0.5\, a_4\, a_5\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) + \\
& 0.5\, a_4\, a_5\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) - 1.0\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 - 1.0\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 - 1.0\, a_5\, lc_{5,1}\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_5)^2 + \\
& 1.0\, a_4\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5) + 1.0\, a_4\, lc_{5,1}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5) - 1.0\, a_4\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \sin(\theta_5) - \\
& 1.0\, a_4\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \sin(\theta_5) + 0.5\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 + 0.5\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 + \\
& 0.5\, {a_5}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 - 4.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) - 4.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) - \\
& 4.0\, I_{xx,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 4.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4)^2 \cos(\theta_5)^2 \sin(\theta_3) + 4.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4) \cos(\theta_5)^2 \sin(\theta_4) + \\
& 4.0\, I_{yy,5}\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5) \sin(\theta_5) + 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 + 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 - \\
& 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 + 2.0\, {lc_{5,1}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 - 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_5)^2 - \\
& 2.0\, {lc_{5,2}}^2\, m_5\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_4)^2 \cos(\theta_5)^2 - 2.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 - 2.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5)^2 - \\
& 2.0\, a_5\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5)^2 - 4.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_4)^2 - 4.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_3)^2 \cos(\theta_5)^2 - \\
& 4.0\, lc_{5,1}\, lc_{5,2}\, m_5\, \dot{\theta}_2 \cos(\theta_4)^2 \cos(\theta_5)^2 + 1.0\, I_{xz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \cos(\theta_5) \sin(\theta_2) + 4.0\, I_{xx,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5)^2 - \\
& 4.0\, I_{yy,5}\, \dot{\theta}_1 \cos(\theta_2) \cos(\theta_3)^2 \cos(\theta_4)^2 \cos(\theta_5)^2 - 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_4) \sin(\theta_3) \sin(\theta_4) - 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_3) \cos(\theta_5) \sin(\theta_3) \sin(\theta_5) - \\
& 4.0\, I_{xy,5}\, \dot{\theta}_2 \cos(\theta_4) \cos(\theta_5) \sin(\theta_4) \sin(\theta_5) - 1.0\, I_{yz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_4) \sin(\theta_2) \sin(\theta_5) - 1.0\, I_{yz,5}\, \dot{\theta}_1 \cos(\theta_3) \cos(\theta_5) \sin(\theta_2) \sin(\theta_4) -
\end{aligned}
$$

$$1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$1.0\,I_{\mathrm{xz},5}\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,I_{\mathrm{yz},5}\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)+1.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+$$
$$4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-0.5\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-0.5\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-0.5\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_5)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)-8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+1.0\,a_5{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,\mathrm{lc}_{5,1}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-4.0\,\mathrm{lc}_{5,2}{}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)-1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2+$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_5)^2+2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\cos(\theta_5)^2-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)+$$
$$2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$2.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$2.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)+$$
$$2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2-1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_5)+$$

$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)-1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)-$$
$$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)\,-\,0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,-$$
$$0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-0.5\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)-2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$2.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$0.5\,a_2\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\cos(\theta_5)^2+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,a_2\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_2\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,I_{\mathrm{xx},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$4.0\,I_{\mathrm{yy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,\mathrm{lc}_{5,2}\,\mathrm{lc}_{5,3}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)^2\,\sin(\theta_3)\,-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)\,-$$
$$4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_5)\,\sin(\theta_5)\,-\,4.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)\,+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+$$

$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\cos(\theta_5)^2\,\sin(\theta_3)+$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_4)+8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_5)+$$
$$8.0\,I_{\mathrm{xy},5}\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,{a_5}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)+$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$2.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$1.0\,{a_5}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,{\mathrm{lc}_{5,1}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$4.0\,{\mathrm{lc}_{5,2}}^2\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)-2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\sin(\theta_3)\,\sin(\theta_5)+$$
$$2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\sin(\theta_4)\,\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_2\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$1.0\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+2.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_2\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)^2\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)^2\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_5)+4.0\,a_5\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)^2\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$4.0\,a_5\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-8.0\,\mathrm{lc}_{5,1}\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)$$

(A49)

$$C_{53} = 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_5)+0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\cos(\theta_5)-$$
$$0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_4)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)\,\sin(\theta_4)-$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_5)-1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-$$
$$1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,a_3\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$0.5\,a_3\,a_5\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,a_3\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) \tag{A50}$$

$$C_{54} = 0.5\,a_4\,a_5\,m_5\,\dot{\theta}_3\,\cos(\theta_5)+0.5\,a_4\,a_5\,m_5\,\dot{\theta}_4\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_3\,\cos(\theta_5)+1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_4\,\cos(\theta_5)-$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_3\,\sin(\theta_5)-1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_4\,\sin(\theta_5)-0.5\,a_4\,a_5\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,a_4\,\mathrm{lc}_{5,1}\,m_5\,\dot{\theta}_1\,\cos(\theta_5)\,\sin(\theta_2)+$$
$$1.0\,a_4\,\mathrm{lc}_{5,2}\,m_5\,\dot{\theta}_1\,\sin(\theta_2)\,\sin(\theta_5) \tag{A51}$$

$$C_{55} = 0 \tag{A52}$$

C. Gravity Vector ($G(q)$)

We can derive the gravity vector as follows:

$$G(q) = \begin{bmatrix} G_1 \\ G_2 \\ G_3 \\ G_4 \\ G_5 \end{bmatrix} \tag{A53}$$

where

$$\begin{aligned}
G_1 = {} & 0.5\,a_1\,g\,m_1\,\cos(\theta_1)+1.0\,a_1\,g\,m_2\,\cos(\theta_1)+1.0\,a_1\,g\,m_3\,\cos(\theta_1)+1.0\,a_1\,g\,m_4\,\cos(\theta_1)+1.0\,a_1\,g\,m_5\,\cos(\theta_1)+ \\
& 1.0\,g\,\mathrm{lc}_1\,m_1\,\cos(\theta_1)-1.0\,g\,\mathrm{lc}_{2,2}\,m_2\,\sin(\theta_1)-1.0\,g\,\mathrm{lc}_3\,m_1\,\sin(\theta_1)+1.0\,g\,\mathrm{lc}_{2,3}\,m_2\,\cos(\theta_1)\,\cos(\theta_2)+1.0\,g\,\mathrm{lc}_{3,3}\,m_3\,\cos(\theta_1)\,\cos(\theta_2)+ \\
& 1.0\,g\,\mathrm{lc}_{4,3}\,m_4\,\cos(\theta_1)\,\cos(\theta_2)+1.0\,g\,\mathrm{lc}_{5,3}\,m_5\,\cos(\theta_1)\,\cos(\theta_2)-0.5\,a_2\,g\,m_2\,\cos(\theta_1)\,\sin(\theta_2)-1.0\,a_2\,g\,m_3\,\cos(\theta_1)\,\sin(\theta_2)- \\
& 1.0\,a_2\,g\,m_4\,\cos(\theta_1)\,\sin(\theta_2)-1.0\,a_2\,g\,m_5\,\cos(\theta_1)\,\sin(\theta_2)+0.5\,a_3\,g\,m_3\,\cos(\theta_3)\,\sin(\theta_1)+1.0\,a_3\,g\,m_4\,\cos(\theta_3)\,\sin(\theta_1)+ \\
& 1.0\,a_3\,g\,m_5\,\cos(\theta_3)\,\sin(\theta_1)-1.0\,g\,\mathrm{lc}_{2,1}\,m_2\,\cos(\theta_1)\,\sin(\theta_2)+1.0\,g\,\mathrm{lc}_{3,1}\,m_3\,\cos(\theta_3)\,\sin(\theta_1)-1.0\,g\,\mathrm{lc}_{3,2}\,m_3\,\sin(\theta_1)\,\sin(\theta_3)+ \\
& 0.5\,a_4\,g\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)+1.0\,a_4\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)-1.0\,g\,\mathrm{lc}_{3,2}\,m_3\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)+ \\
& 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)-0.5\,a_3\,g\,m_3\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_3\,g\,m_4\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)- \\
& 1.0\,a_3\,g\,m_5\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,g\,\mathrm{lc}_{3,1}\,m_3\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4)- \\
& 1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3)-0.5\,a_4\,g\,m_4\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,a_4\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)- \\
& 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)- \\
& 0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)- \\
& 1.0\,a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)-0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_5)-0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_4)- \\
& 0.5\,a_5\,g\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3)-1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)- \\
& 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3)+ \\
& 1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_5)+ \\
& 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+ \\
& 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+ \\
& 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)- \\
& 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)+ \\
& 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_4)+ \\
& 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)+0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)+ \\
& 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)+0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)
\end{aligned} \tag{A54}$$

$$G_2 = 1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,a_2\,g\,m_3\,\cos(\theta_2)\,\sin(\theta_1) - 1.0\,a_2\,g\,m_4\,\cos(\theta_2)\,\sin(\theta_1) - 1.0\,a_2\,g\,m_5\,\cos(\theta_2)\,\sin(\theta_1) - 1.0\,g\,\mathrm{lc}_{2,1}\,m_2\,\cos(\theta_2)\,\sin(\theta_1) - 1.0\,g\,\mathrm{lc}_{2,3}\,m_2\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,g\,\mathrm{lc}_{3,3}\,m_3\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,g\,\mathrm{lc}_{4,3}\,m_4\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,g\,\mathrm{lc}_{5,3}\,m_5\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,g\,\mathrm{lc}_{3,2}\,m_3\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1) - \frac{a_3\,g\,m_3\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3)}{2} - 1.0\,a_3\,g\,m_4\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3) - 1.0\,a_3\,g\,m_5\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3) - 1.0\,g\,\mathrm{lc}_{3,1}\,m_3\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3) - 1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1) - \frac{a_4\,g\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4)}{2} - \frac{a_4\,g\,m_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3)}{2} - 1.0\,a_4\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4) - 1.0\,a_4\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3) - 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4) - 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3) - \frac{a_2\,g\,m_2\,\cos(\theta_2)\,\sin(\theta_1)}{2} + 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4)\,\sin(\theta_5) + 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_5) + 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - \frac{a_5\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)}{2} - 1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1) + 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_5) + 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_4) + 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3) + \frac{a_5\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_4)\,\sin(\theta_5)}{2} + \frac{a_5\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_5)}{2} + \frac{a_5\,g\,m_5\,\cos(\theta_2)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)}{2} \tag{A55}$$

$$G_3 = g\,\mathrm{lc}_{3,2}\,m_3\,\cos(\theta_1)\,\cos(\theta_3) + 0.5\,a_3\,g\,m_3\,\cos(\theta_1)\,\sin(\theta_3) + a_3\,g\,m_4\,\cos(\theta_1)\,\sin(\theta_3) + a_3\,g\,m_5\,\cos(\theta_1)\,\sin(\theta_3) + g\,\mathrm{lc}_{3,1}\,m_3\,\cos(\theta_1)\,\sin(\theta_3) + g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4) + 0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4) + 0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3) + a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4) + a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3) + g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4) + g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3) - 0.5\,a_3\,g\,m_3\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,a_3\,g\,m_4\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,a_3\,g\,m_5\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,g\,\mathrm{lc}_{3,1}\,m_3\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2) - g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4) + g\,\mathrm{lc}_{3,2}\,m_3\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3) - 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5) - 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4) - 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3) - 0.5\,a_4\,g\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2) - 1.0\,a_4\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2) - 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) - 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2) - g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5) - g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4) + g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4) + g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3) + 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + 0.5\,a_4\,g\,m_4\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 1.0\,a_4\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) + 0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5) + g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5) + g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4) + g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3) - g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5) - g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5) - g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4) - 0.5\,a_5\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) - g\,\mathrm{lc}_{5,1}\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5) + g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2) + 0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5) + 0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4) + 0.5\,a_5\,g\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3) \tag{A56}$$

$$G_4 = 1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)+0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)+0.5\,a_4\,g\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)+$$
$$1.0\,a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)+1.0\,a_4\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)+1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)+$$
$$1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)-1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-0.5\,a_4\,g\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)-$$
$$1.0\,a_4\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)-0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$1.0\,g\,\mathrm{lc}_{4,2}\,m_4\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)+1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+0.5\,a_4\,g\,m_4\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+$$
$$1.0\,a_4\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+1.0\,g\,\mathrm{lc}_{4,1}\,m_4\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)+0.5\,a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+$$
$$1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)+$$
$$1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-$$
$$0.5\,a_5\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)+$$
$$0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5)+0.5\,a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)+0.5\,a_5\,g\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)$$

(A57)

$$G_5 = 1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_3)-$$
$$\frac{a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)}{2}-\frac{a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)}{2}-\frac{a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)}{2}-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)-$$
$$1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_4)\,\sin(\theta_3)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_5)\,\sin(\theta_3)\,\sin(\theta_4)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_5)+$$
$$\frac{a_5\,g\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)}{2}+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_1)\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5)+$$
$$1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)+1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)-$$
$$1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)\,\sin(\theta_5)-1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_5)-$$
$$1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)-\frac{a_5\,g\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)}{2}-1.0\,g\,\mathrm{lc}_{5,1}\,m_5\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)\,\sin(\theta_4)\,\sin(\theta_5)+$$
$$1.0\,g\,\mathrm{lc}_{5,2}\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)+\frac{a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_4)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_5)}{2}+\frac{a_5\,g\,m_5\,\cos(\theta_3)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_4)}{2}+$$
$$\frac{a_5\,g\,m_5\,\cos(\theta_4)\,\cos(\theta_5)\,\sin(\theta_1)\,\sin(\theta_2)\,\sin(\theta_3)}{2}$$

(A58)