

$$\ddot{\theta}_1 = \frac{\left(2 l_2 m_2^2 \cos (\phi_1) \sin (\phi_1)+\left(2 l_2 m_1 m_2+l_2 m_2^2\right) \cos \left(\phi_1\right)^2-2\left(2 l_2 m_2^2 \cos \left(\phi_1\right) \sin \left(\phi_1\right)+\left(2 l_2 m_1 m_2+l_2 m_2^2\right) \cos \left(\phi_1\right)^2+\left(2 l_2 m_1 m_2+l_2 m_2^2\right) \sin \left(\phi_1\right)^2\right) \sin \left(\phi_1\right)}{\left(2 l_2 m_1^2+2 l_2 m_1 m_2+l_2 m_2^2\right) \cos \left(\phi_1\right)^2+\left(2 l_2 m_1^2+2 l_2 m_1 m_2+l_2 m_2^2\right) \sin \left(\phi_1\right)^2} \quad (1)$$

$$\ddot{\theta}_2 = -\frac{\left(4\left(\left(l_2 m_1^2+l_2 m_1 m_2\right) \cos \left(\phi_1\right)^4+2\left(l_2 m_1^2+l_2 m_1 m_2\right) \cos \left(\phi_1\right)^2 \sin \left(\phi_1\right)^2+\left(l_2 m_1^2+l_2 m_1 m_2\right) \sin \left(\phi_1\right)^4\right)-\left(\left(l_2 m_1^2+l_2 m_1 m_2\right) \cos \left(\phi_1\right)^4+\left(l_2 m_1^2+l_2 m_1 m_2\right) \sin \left(\phi_1\right)^4\right)\right) \sin \left(\phi_1\right)}{\left(2 l_2 m_1^2+2 l_2 m_1 m_2+l_2 m_2^2\right) \cos \left(\phi_1\right)^2+\left(2 l_2 m_1^2+2 l_2 m_1 m_2+l_2 m_2^2\right) \sin \left(\phi_1\right)^2} \quad (2)$$