$$\text{A01} := \{\{\text{Cos}[\theta_1], -\text{Sin}[\theta_1]\,\text{Cos}[\alpha_1], \text{Sin}[\theta_1]\,\text{Sin}[\alpha_1], a_1\text{Cos}[\theta_1]\},$$

$$\{\text{Sin}[\theta_1], \text{Cos}[\theta_1]\,\text{Cos}[\alpha_1], -\text{Cos}[\theta_1]\,\text{Sin}[\alpha_1], a_1\text{Sin}[\theta_1]\}, \{0, \text{Sin}[\alpha_1], \text{Cos}[\alpha_1], d_1\}, \{0,0,0,1\}\};$$

$$\theta_1 = -q_1;$$

$$a_1 = -658.07;$$

$$\alpha_1 = -\pi/2;$$

$$d_1 = 1134;$$

$$\text{A12} := \{\{\text{Cos}[\theta_2], -\text{Sin}[\theta_2]\,\text{Cos}[\alpha_2], \text{Sin}[\theta_2]\,\text{Sin}[\alpha_2], a_2\text{Cos}[\theta_2]\},$$

$$\{\text{Sin}[\theta_2], \text{Cos}[\theta_2]\,\text{Cos}[\alpha_2], -\text{Cos}[\theta_2]\,\text{Sin}[\alpha_2], a_2\text{Sin}[\theta_2]\}, \{0, \text{Sin}[\alpha_2], \text{Cos}[\alpha_2], d_2\}, \{0,0,0,1\}\};$$

$$\theta_2 = -q_2;$$

$$a_2 = -1689.31;$$

$$\alpha_2 = 0;$$

$$d_2 = 0;$$

$$\text{A23} := \{\{\text{Cos}[\theta_3], -\text{Sin}[\theta_3]\,\text{Cos}[\alpha_3], \text{Sin}[\theta_3]\,\text{Sin}[\alpha_3], a_3\text{Cos}[\theta_3]\},$$

$$\{\text{Sin}[\theta_3], \text{Cos}[\theta_3]\,\text{Cos}[\alpha_3], -\text{Cos}[\theta_3]\,\text{Sin}[\alpha_3], a_3\text{Sin}[\theta_3]\}, \{0, \text{Sin}[\alpha_3], \text{Cos}[\alpha_3], d_3\}, \{0,0,0,1\}\};$$

$$\theta_3 = \pi/2 + q_3;$$

$$a_3 = -2128.98;$$

$$\alpha_3 = \pi/2;$$

$$d_3 = 367.5;$$

$$\text{A03} = \text{Simplify}[\text{A01.A12.A23}];$$

$$\text{Px} = \text{Simplify}[\{\{1,0,0,0\},\{0,0,0,0\},\{0,0,0,0\}\}.\text{A03}.\{0,0,0,1\}]$$

$$\text{Py} = \text{Simplify}[\{\{0,0,0,0\},\{0,1,0,0\},\{0,0,0,0\}\}.\text{A03}.\{0,0,0,1\}]$$

$$\text{Pz} = \text{Simplify}[\{\{0,0,0,0\},\{0,0,0,0\},\{0,0,1,0\}\}.\text{A03}.\{0,0,0,1\}]$$

$$R = \{\{1,0,0,0\},\{0,1,0,0\},\{0,0,1,0\}\}.\text{A03}.\{\{1,0,0\},\{0,1,0\},\{0,0,1\},\{0,0,0\}\};$$

$$\text{Dimensions}[\text{Px}]$$

$$S_1 = D[R, q_1].\text{Transpose}[R];$$

$$\text{wx}_1 = S_1[[3,2]];$$

$\mathbf{wy_1} = S_1[[1,3]];$

$\mathbf{wz_1} = S_1[[2,1]];$

$S_2 = D[R, q_2].\text{Transpose}[R];$

$\mathbf{wx_2} = S_2[[3,2]];$

$\mathbf{wy_2} = S_2[[1,3]];$

$\mathbf{wz_2} = S_2[[2,1]];$

$S_3 = D[R, q_3].\text{Transpose}[R];$

$\mathbf{wx_3} = S_3[[3,2]];$

$\mathbf{wy_3} = S_3[[1,3]];$

$\mathbf{wz_3} = S_3[[2,1]];$

$J = \text{FullSimplify}[\{\{D[\text{Px}, q_1], D[\text{Px}, q_2], D[\text{Px}, q_3]\}, \{D[\text{Py}, q_1], D[\text{Py}, q_2], D[\text{Py}, q_3]\},$

$\{D[\text{Pz}, q_1], D[\text{Pz}, q_2], D[\text{Py}, q_3]\}, \{\mathbf{wx_1}, \mathbf{wx_2}, \mathbf{wx_3}\}, \{\mathbf{wy_1}, \mathbf{wy_2}, \mathbf{wy_3}\}, \{\mathbf{wz_1}, \mathbf{wz_2}, \mathbf{wz_3}\}\}]$

$\text{Dimensions}[J]$

$\{367.5\text{Sin}[q_1] + \text{Cos}[q_1](-658.07 - 2128.98\text{Cos}[q_3]\,\text{Sin}[q_2] + \text{Cos}[q_2](-1689.31 + 2128.98\text{Sin}[q_3])), 0., 0.\}$

$\{0., 367.5\text{Cos}[q_1] + \text{Sin}[q_1](658.07 + 2128.98\text{Cos}[q_3]\,\text{Sin}[q_2] + \text{Cos}[q_2](1689.31 - 2128.98\text{Sin}[q_3])), 0.\}$

$\{0., 0., 1134. + 2128.98\text{Cos}[q_2]\,\text{Cos}[q_3] + \text{Sin}[q_2](-1689.31 + 2128.98\text{Sin}[q_3])\}$

$\{3\}$

$\{\{\{367.5\text{Cos}[q_1] + \text{Sin}[q_1](658.07 + 1689.31\text{Cos}[q_2] + 2128.98\text{Sin}[q_2 - q_3]), 0, 0\}, \{\text{Cos}[q_1](-2128.98\text{Cos}[q_2 -$

$\{6, 3\}$

$\mathbf{A01//MatrixForm}$

$\mathbf{A12//MatrixForm}$

$\mathbf{A23//MatrixForm}$

$$\begin{pmatrix} \text{Cos}[q_1] & 0 & \text{Sin}[q_1] & -658.07\text{Cos}[q_1] \\ -\text{Sin}[q_1] & 0 & \text{Cos}[q_1] & 658.07\text{Sin}[q_1] \\ 0 & -1 & 0 & 1134 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} \text{Cos}[q_2] & \text{Sin}[q_2] & 0 & -1689.31\text{Cos}[q_2] \\ -\text{Sin}[q_2] & \text{Cos}[q_2] & 0 & 1689.31\text{Sin}[q_2] \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} -\text{Sin}[q_3] & 0 & \text{Cos}[q_3] & 2128.98\text{Sin}[q_3] \\ \text{Cos}[q_3] & 0 & \text{Sin}[q_3] & -2128.98\text{Cos}[q_3] \\ 0 & 1 & 0 & 367.5 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Simplify[A03]//MatrixForm

Simplify[Px]//MatrixForm

Simplify[Py]//MatrixForm

Simplify[Pz]//MatrixForm

Simplify[*R*]//MatrixForm

$$\begin{pmatrix} \text{Cos}[q_1]\,\text{Sin}[q_2-q_3] & \text{Sin}[q_1] & \text{Cos}[q_1]\,\text{Cos}[q_2-q_3] & 367.5\text{Sin}[q_1]+\text{Cos}[q_1]\,(-658.07-2128.98\text{Cos}[q_3]\,\text{S} \\ -\text{Sin}[q_1]\,\text{Sin}[q_2-q_3] & \text{Cos}[q_1] & -\text{Cos}[q_2-q_3]\,\text{Sin}[q_1] & 367.5\text{Cos}[q_1]+\text{Sin}[q_1]\,(658.07\ +2128.98\text{Cos}[q_3]\,\text{S} \\ -\text{Cos}[q_2-q_3] & 0 & \text{Sin}[q_2-q_3] & 1134.\ +2128.98\text{Cos}[q_2]\,\text{Cos}[q_3]+\text{Sin} \\ 0. & 0. & 0. & 1. \end{pmatrix}$$

$\{\{\text{Cos}[q_1]\,\text{Sin}[q_2-q_3]\,,\text{Sin}[q_1]\,,\text{Cos}[q_1]\,\text{Cos}[q_2-q_3]\,,367.5\text{Sin}[q_1]+\text{Cos}[q_1]\,(-658.07-2128.98\text{Cos}[q_3]\,\text{Sin}[q_2]$

$\{\{\text{Cos}[q_1]\,\text{Sin}[q_2-q_3]\,,\text{Sin}[q_1]\,,\text{Cos}[q_1]\,\text{Cos}[q_2-q_3]\,,367.5\text{Sin}[q_1]+\text{Cos}[q_1]\,(-658.07-2128.98\text{Cos}[q_3]\,\text{Sin}[q_2]$

$\{\{\text{Cos}[q_1]\,\text{Sin}[q_2-q_3]\,,\text{Sin}[q_1]\,,\text{Cos}[q_1]\,\text{Cos}[q_2-q_3]\,,367.5\text{Sin}[q_1]+\text{Cos}[q_1]\,(-658.07-2128.98\text{Cos}[q_3]\,\text{Sin}[q_2]$

$$\begin{pmatrix} \text{Cos}\,[q_1]\,\text{Sin}\,[q_2-q_3] & \text{Sin}\,[q_1] & \text{Cos}\,[q_1]\,\text{Cos}\,[q_2-q_3] \\ -\text{Sin}\,[q_1]\,\text{Sin}\,[q_2-q_3] & \text{Cos}\,[q_1] & -\text{Cos}\,[q_2-q_3]\,\text{Sin}\,[q_1] \\ -\text{Cos}\,[q_2-q_3] & 0. & \text{Sin}\,[q_2-q_3] \end{pmatrix}$$