Formulae Given with Test #3

$$\mathrm{Rot}(X,\theta)=\begin{bmatrix}1 & 0 & 0 & 0\\ 0 & \mathrm{C}\theta & -\mathrm{S}\theta & 0\\ 0 & \mathrm{S}\theta & \mathrm{C}\theta & 0\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$\mathrm{Rot}(Y,\theta)=\begin{bmatrix}\mathrm{C}\theta & 0 & \mathrm{S}\theta & 0\\ 0 & 1 & 0 & 0\\ -\mathrm{S}\theta & 0 & \mathrm{C}\theta & 0\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$\mathrm{Rot}(Z,\theta)=\begin{bmatrix}\mathrm{C}\theta & -\mathrm{S}\theta & 0 & 0\\ \mathrm{S}\theta & \mathrm{C}\theta & 0 & 0\\ 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$\mathrm{Trans}(a,b,c)=\begin{bmatrix}1 & 0 & 0 & a\\ 0 & 1 & 0 & b\\ 0 & 0 & 1 & c\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$T^{-1}=\begin{bmatrix}n_x & n_y & n_z & -\vec{P}\bullet\vec{n}\\ o_x & o_y & o_z & -\vec{P}\bullet\vec{o}\\ a_x & a_y & a_z & -\vec{P}\bullet\vec{a}\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$A_{n+1}={}^{n}T_{n+1}=\begin{bmatrix}\mathrm{C}\theta_{n+1} & -\mathrm{S}\theta_{n+1}\mathrm{C}\alpha_{n+1} & \mathrm{S}\theta_{n+1}\mathrm{S}\alpha_{n+1} & a_{n+1}\mathrm{C}\theta_{n+1}\\ \mathrm{S}\theta_{n+1} & \mathrm{C}\theta_{n+1}\mathrm{C}\alpha_{n+1} & -\mathrm{C}\theta_{n+1}\mathrm{S}\alpha_{n+1} & a_{n+1}\mathrm{S}\theta_{n+1}\\ 0 & \mathrm{S}\alpha_{n+1} & \mathrm{C}\alpha_{n+1} & d_{n+1}\\ 0 & 0 & 0 & 1\end{bmatrix}$$

$$S\theta_1 C\theta_2 + C\theta_1 S\theta_2 = S(\theta_1+\theta_2) = S\theta_{12}$$

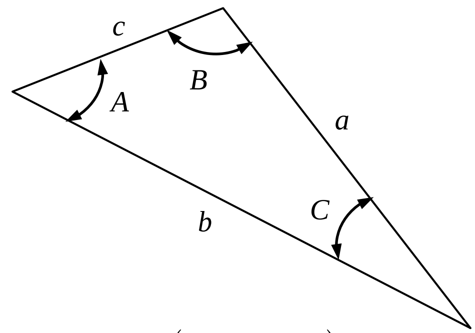
$$C\theta_1 C\theta_2 - S\theta_1 S\theta_2 = C(\theta_1+\theta_2) = C\theta_{12}$$

if $A=\begin{bmatrix}a_{11} & a_{12}\\ a_{21} & a_{22}\end{bmatrix}$ then

$$A^{-1}=\frac{1}{a_{11}a_{22}-a_{12}a_{21}}\begin{bmatrix}a_{22} & -a_{12}\\ -a_{21} & a_{11}\end{bmatrix}$$

$$\det(J)=j_{11}(j_{33}j_{22}-j_{32}j_{23})-j_{21}(j_{33}j_{12}-j_{32}j_{13})+j_{31}(j_{23}j_{12}-j_{22}j_{13})$$

if $u=\sin\theta$ and $v=\cos\theta$ then $\theta=\mathrm{atan2}(u,v)$



$$\cos A=\left(b^2+c^2-a^2\right)/\left(2bc\right)$$

$$\cos B=\left(a^2+c^2-b^2\right)/\left(2ac\right)$$

$$\cos C=\left(a^2+b^2-c^2\right)/\left(2ab\right)$$

$$F_i=\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial \dot{x}_i}\right)-\frac{\partial L}{\partial x_i}$$

$$\tau_i=\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial \dot{\theta}_i}\right)-\frac{\partial L}{\partial \theta_i}$$

$$K_j=\tfrac{1}{2}m_j {v_{cj}}^2+\tfrac{1}{2}I_j{\omega_j}^2$$

$$P_j=-m_j G^T p_{cj}$$