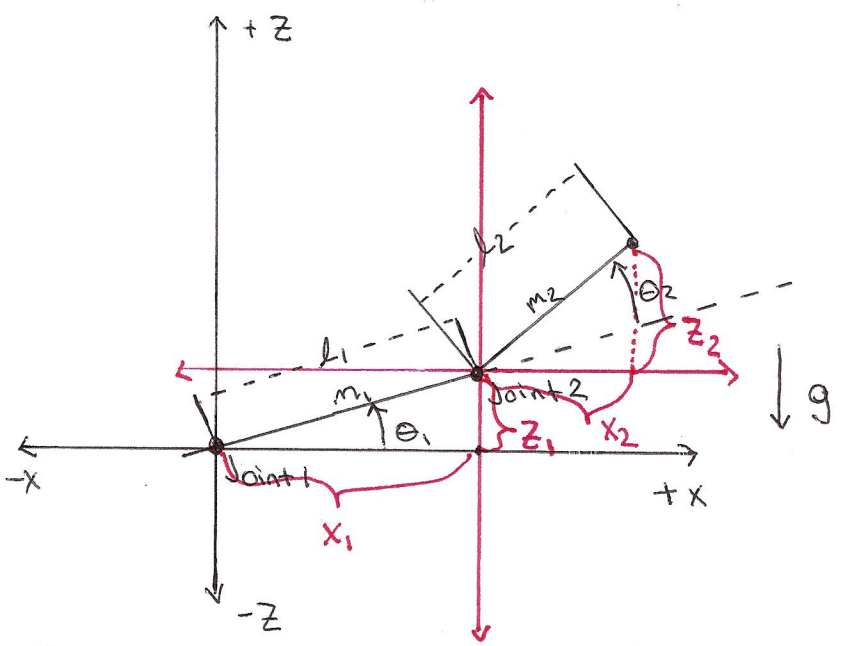
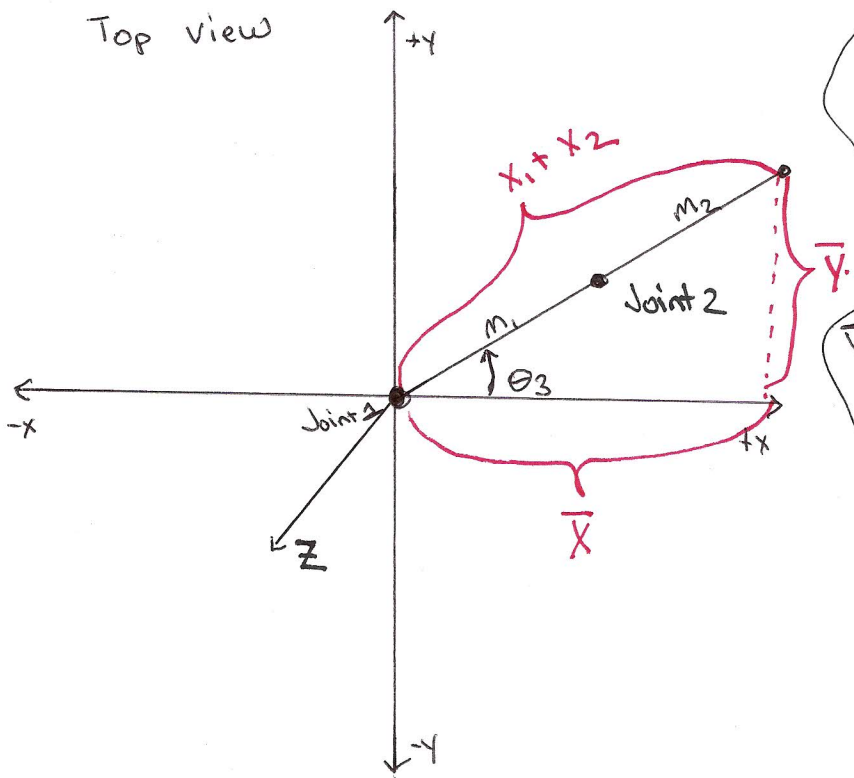


$$X_1 = l_1 \cos\theta_1 \qquad Z_1 = l_1 \sin\theta_1$$

$$X_2 = l_2 \cos(\theta_1+\theta_2) \qquad Z_2 = l_2 \sin(\theta_1+\theta_2)$$

$$Z = Z_1 + Z_2 = l_1 \sin\theta_1 + l_2 \sin(\theta_1+\theta_2)$$



$$\bar{X} = (X_1+X_2)\cos\theta_3 = (l_1\cos\theta_1 + l_2\cos(\theta_1+\theta_2))\cos\theta_3$$

$$\bar{Y} = (X_1+X_2)\sin\theta_3 = (l_1\cos\theta_1 + l_2\cos(\theta_1+\theta_2))\sin\theta_3$$