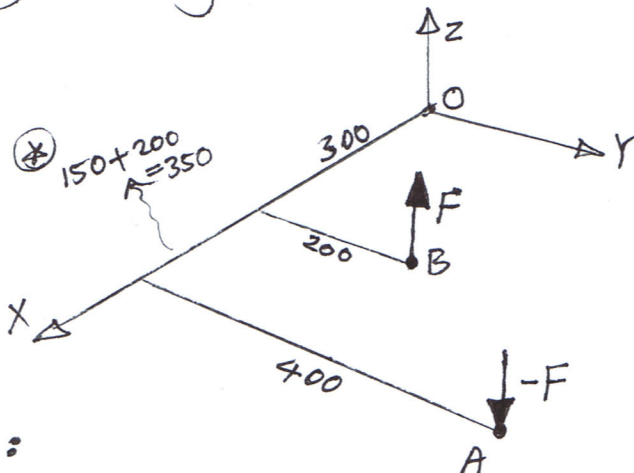


Problem 4.79

Express the moment of the couple acting on the pipe assembly in Cartesian Vector form. Solve the problem (a) using Eq 4-13 and (b) Summing the moment of each force about point O.



Section (a)

choose
You can either \vec{r}_{AB} or \vec{r}_{BA} as long as you consider the correct force:

$$M_{\text{couple}} = \vec{r}_{AB} \times \vec{F} \quad \text{OR} \quad = \vec{r}_{BA} \times -\vec{F}$$

lets consider the positive \vec{F} : $\vec{M}_c = \vec{r}_{AB} \times \vec{F}$

$$A \begin{array}{|l} 650 \\ 400 \\ 0 \end{array} \quad B \begin{array}{|l} 300 \\ 200 \\ 0 \end{array} \quad \vec{r}_{AB} = -350\hat{i} - 200\hat{j} \text{ mm}$$

$$\vec{F} = 25\hat{k} \text{ N}$$

$$\vec{M}_c = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -350 & -200 & 0 \\ 0 & 0 & 25 \end{vmatrix} = (-200)(25)\hat{i} - (-350)(25)\hat{j} + 0\hat{k}$$

$$= -5000\hat{i} + 8750\hat{j} \text{ N}\cdot\text{mm}$$

$$\vec{M}_c = -5\hat{i} + 8.75\hat{j} \text{ N}\cdot\text{m}$$

both correct