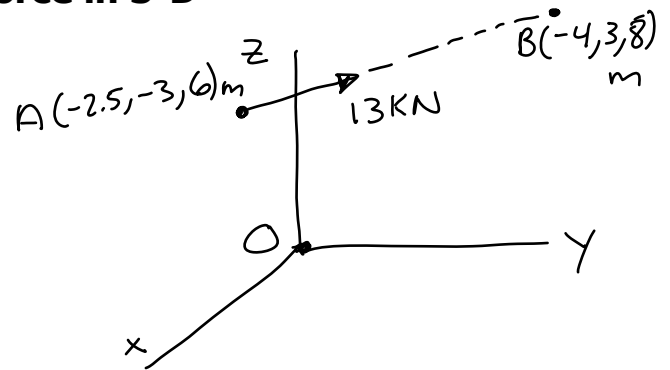


Moments of Force in 3-D

Problem Statement: Determine the moment of force at A about Point O.



1.) Draw the FBD.

Given

2.) Determine the position vector.

$$\vec{r}_{OA} = \{-2.5\hat{i} - 3\hat{j} + 6\hat{k}\} \text{ m}$$

3.) Determine the force vector.

$$\vec{r}_{AB} = \{-1.5\hat{i} + 6\hat{j} + 2\hat{k}\} \text{ m} \quad r_{AB} = 6.5 \text{ m}$$

$$\vec{u}_{AB} = \{-0.2308\hat{i} + 0.9231\hat{j} + 0.3077\hat{k}\}$$

$$\vec{F}_{AB} = (13 \text{ kN})\vec{u}_{AB} = \{-3\hat{i} + 12\hat{j} + 4\hat{k}\} \text{ kN}$$

4.) Evaluate the cross-product.

$$\vec{M}_O = \vec{r}_{OA} \times \vec{F}_{AB} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2.5 & -3 & 6 \\ -3 & 12 & 4 \end{vmatrix}$$

$$\vec{M}_O = \{ [(-3)(4) - (6)(12)]\hat{i} - [(-2.5)(4) - (6)(-3)]\hat{j} + [(-2.5)(12) - (-3)(-3)]\hat{k} \} \text{ kN}\cdot\text{m}$$

$$\vec{M}_O = \{-84\hat{i} - 8\hat{j} - 39\hat{k}\} \text{ kN}\cdot\text{m}$$