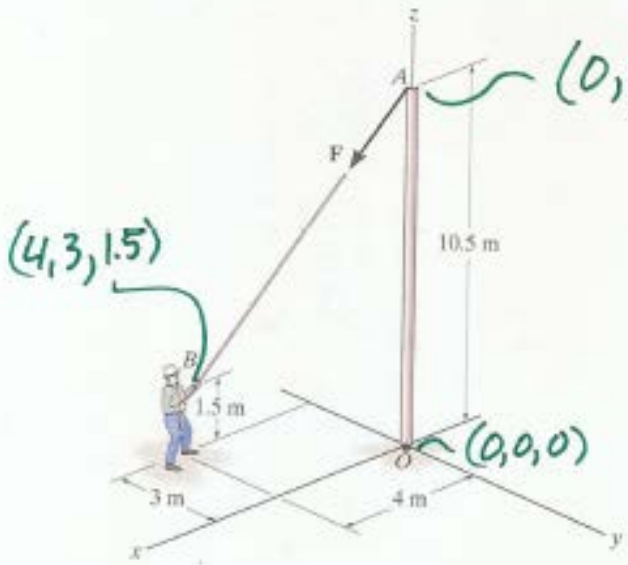
3D Moments 2

The man pulls on the rope with a force of ***F*** = 20 N. Determine the moment that this force exerts about the base of the pole at *O*. Solve the problem two ways, i.e. by using a position vector from *O* to *A*, then *O* to *B*.



(0,0,10.5)

(4,3,1.5)

(0,0,0)

$\vec{r}_{A/O} = [0\ 0\ 10.5]\ m$

$\vec{r}_{B/O} = [4\ -3\ 1.5]\ m$

$\vec{r}_{B/A} = [4\ -3\ -9]\ m \quad |\vec{r}_{B/A}| = \sqrt{4^2+(-3)^2+(-9)^2} = 10.3\ m$

$\hat{u}_{B/A} = \frac{[4\ -3\ -9]\ m}{10.3\ m} = [0.388\ -0.291\ -0.874]$

$\vec{F} = 20\ N * \hat{u}_{B/A} = 20N[0.388\ -0.291\ -0.874]$
$= [7.77\ -5.83\ -17.5]\ N$

$\vec{m}_O = \vec{r}_{A/O} \times \vec{F} = [0\ 0\ 10.5]_m \times [7.77\ -5.83\ -17.5]\ N = [61.2\ 81.6\ 0]\ Nm$
$= \vec{r}_{B/O} \times \vec{F} = [4\ -3\ 1.5]_m \times [7.77\ -5.83\ -17.5]\ N$ ABOUT O