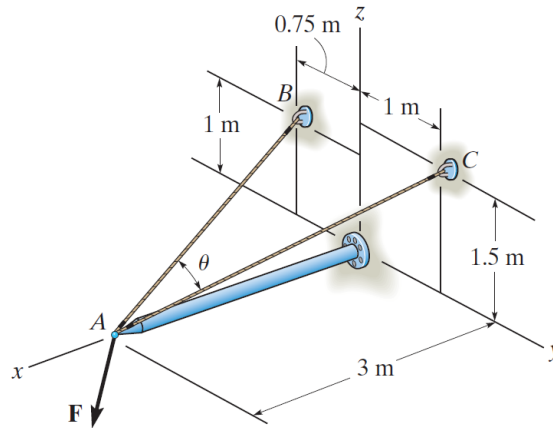


Problem 2-118

Determine the angle θ between cables AB and AC .



Probs. 2-117/118

Solution

Write the position vectors to the points A , B , and C .

$$\mathbf{r}_A = \langle 3, 0, 0 \rangle \text{ m}$$

$$\mathbf{r}_B = \langle 0, -0.75, 1 \rangle \text{ m}$$

$$\mathbf{r}_C = \langle 0, 1, 1.5 \rangle \text{ m}$$

The unit vector in the direction from A to B is

$$\hat{\mathbf{u}}_{AB} = \frac{\mathbf{r}_B - \mathbf{r}_A}{|\mathbf{r}_B - \mathbf{r}_A|} = \frac{\langle -3, -0.75, 1 \rangle}{\sqrt{(-3)^2 + (-0.75)^2 + (1)^2}} = \frac{\langle -3, -0.75, 1 \rangle}{3.25}$$

The unit vector in the direction from A to C is

$$\hat{\mathbf{u}}_{AC} = \frac{\mathbf{r}_C - \mathbf{r}_A}{|\mathbf{r}_C - \mathbf{r}_A|} = \frac{\langle -3, 1, 1.5 \rangle}{\sqrt{(-3)^2 + (1)^2 + (1.5)^2}} = \frac{\langle -3, 1, 1.5 \rangle}{3.5}$$

Take the dot product of these two unit vectors.

$$\cos \theta = \hat{\mathbf{u}}_{AB} \cdot \hat{\mathbf{u}}_{AC} = \frac{\langle -3, -0.75, 1 \rangle}{3.25} \cdot \frac{\langle -3, 1, 1.5 \rangle}{3.5} = \frac{9.75}{(3.25)(3.5)} = \frac{6}{7}$$

Therefore, the angle θ between the cables is

$$\theta = \cos^{-1} \left(\frac{6}{7} \right) \approx 31.0^\circ$$