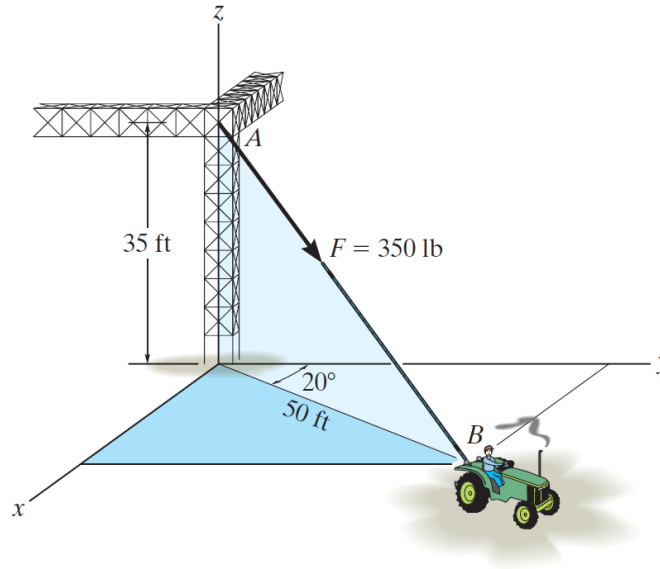


Problem R2-5

The cable attached to the tractor at B exerts a force of 350 lb on the framework. Express this force as a Cartesian vector.



Prob. R2-5

Solution

Write the position vectors to the points A and B .

$$\mathbf{r}_A = \langle 0, 0, 35 \rangle \text{ ft}$$

$$\mathbf{r}_B = 50 \langle \sin 20^\circ, \cos 20^\circ, 0 \rangle \text{ ft}$$

The unit vector going from A to B is

$$\hat{\mathbf{u}}_{AB} = \frac{\mathbf{r}_B - \mathbf{r}_A}{|\mathbf{r}_B - \mathbf{r}_A|} = \frac{\langle 50 \sin 20^\circ, 50 \cos 20^\circ, -35 \rangle}{\sqrt{(50 \sin 20^\circ)^2 + (50 \cos 20^\circ)^2 + (-35)^2}}$$

Therefore, the force is

$$\mathbf{F} = F \hat{\mathbf{u}}_{AB} = 350 \frac{\langle 50 \sin 20^\circ, 50 \cos 20^\circ, -35 \rangle}{\sqrt{(50 \sin 20^\circ)^2 + (50 \cos 20^\circ)^2 + (-35)^2}} \text{ lb} \approx \langle 98.1, 269, -201 \rangle \text{ lb.}$$