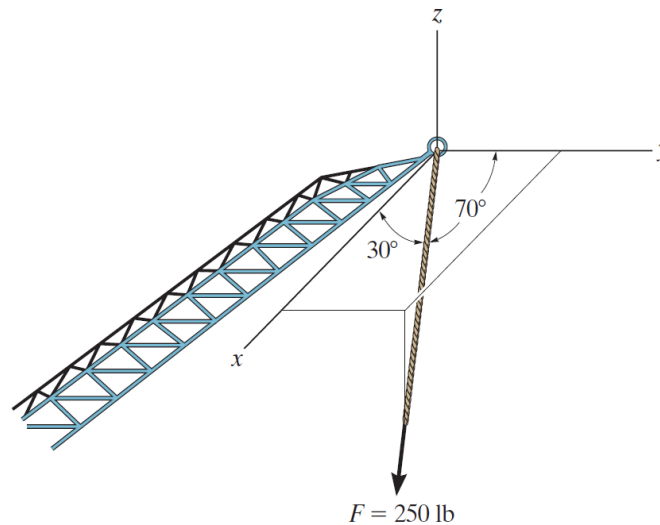


Problem R2-4

The cable at the end of the crane boom exerts a force of 250 lb on the boom as shown. Express \mathbf{F} as a Cartesian vector.



Prob. R2-4

Solution

Begin by finding γ , the angle that \mathbf{F} makes with the positive z -axis.

$$\cos^2 30^\circ + \cos^2 70^\circ + \cos^2 \gamma = 1 \quad \rightarrow \quad \gamma = \cos^{-1} \left(\pm \sqrt{1 - \cos^2 70^\circ - \cos^2 30^\circ} \right)$$

$$\approx \{68.6^\circ, 111^\circ\}$$

Since the force goes below the xy -plane, the larger angle for γ is chosen: $\gamma \approx 111^\circ$. Now write the force in component form.

$$\mathbf{F} = 250 \langle \cos 30^\circ, \cos 70^\circ, \cos \gamma \rangle \text{ lb}$$

$$\approx \langle 217, 85.5, -91.2 \rangle \text{ lb}$$