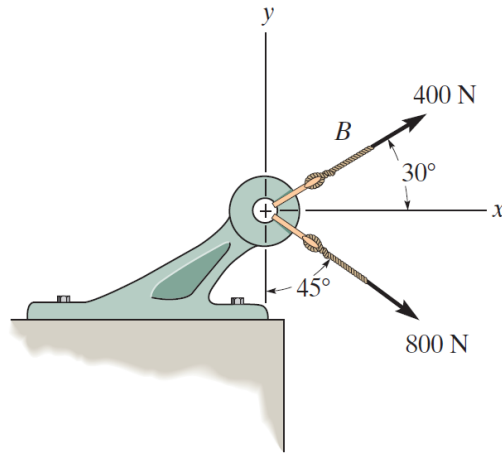


Problem 2-33

Determine the magnitude of the resultant force and its direction, measured clockwise from the positive x axis.



Prob. 2-33

Solution

Write each of the forces in component form.

$$\mathbf{F}_1 = 400 \langle \cos 30^\circ, \sin 30^\circ \rangle \text{ N}$$

$$\mathbf{F}_2 = 800 \langle \sin 45^\circ, -\cos 45^\circ \rangle \text{ N}$$

Add them together to get the resultant force \mathbf{F}_R .

$$\begin{aligned} \mathbf{F}_R &= \mathbf{F}_1 + \mathbf{F}_2 \\ &= \langle 400 \cos 30^\circ + 800 \sin 45^\circ, 400 \sin 30^\circ - 800 \cos 45^\circ \rangle \text{ N} \\ &\approx \langle 912, -366 \rangle \text{ N} \end{aligned}$$

Its magnitude is

$$\begin{aligned} |\mathbf{F}_R| &= \sqrt{(400 \cos 30^\circ + 800 \sin 45^\circ)^2 + (400 \sin 30^\circ - 800 \cos 45^\circ)^2} \text{ N} \\ F_R &\approx 983 \text{ N}, \end{aligned}$$

and the direction it points in counterclockwise from the positive x -axis is

$$\tan \phi = \frac{400 \sin 30^\circ - 800 \cos 45^\circ}{400 \cos 30^\circ + 800 \sin 45^\circ} \rightarrow \phi \approx -21.8^\circ.$$

Therefore, the angle of the resultant force clockwise from the positive x -axis is 21.8° .