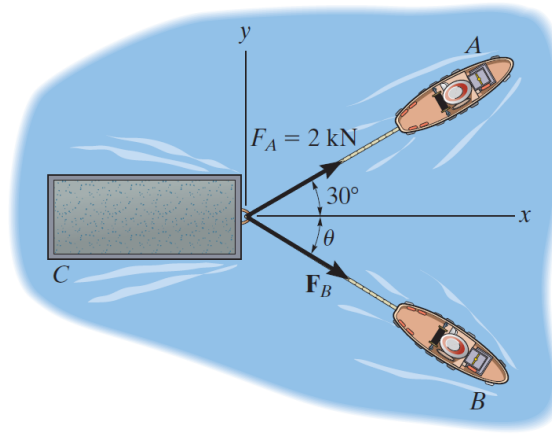


Problem 2-29

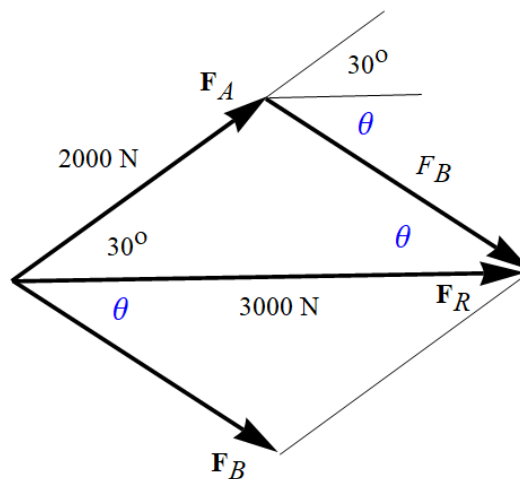
If the resultant force of the two tugboats is 3 kN, directed along the positive x axis, determine the required magnitude of force \mathbf{F}_B and its direction θ .



Probs. 2-29/30/31

Solution

Draw the triangle that \mathbf{F}_A and \mathbf{F}_B and their resultant make.



Use the law of cosines to determine the magnitude of \mathbf{F}_B .

$$F_B^2 = 2000^2 + 3000^2 - 2(2000)(3000) \cos 30^\circ$$

$$F_B = \sqrt{2000^2 + 3000^2 - 2(2000)(3000) \cos 30^\circ} \text{ N}$$

$$\approx 1.61 \times 10^3 \text{ N}$$

Use the law of sines to determine θ .

$$\frac{F_B}{\sin 30^\circ} = \frac{2000 \text{ N}}{\sin \theta} \rightarrow \sin \theta = \frac{2000 \text{ N}}{F_B} \sin 30^\circ \rightarrow \theta \approx 38.3^\circ$$