Chapter 2 Problem 60 [†]

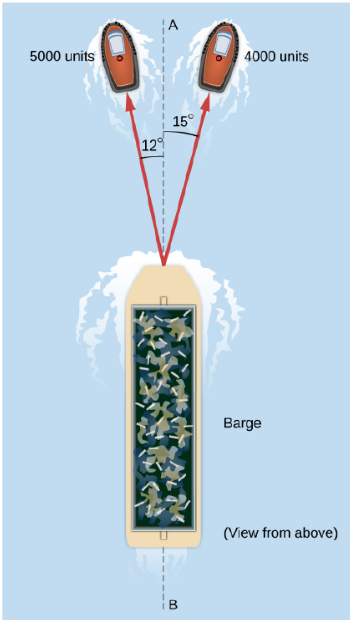

Figure 2.34

Given

$\vec{F_1} = 4000\ \angle 15° = 4000\cos(15)\hat{\imath} + 4000\sin(15)\hat{\jmath} = \{3864\hat{\imath} + 1035\hat{\jmath}\}$
$\vec{F_2} = 5000\ \angle -12° = 5000\cos(-12)\hat{\imath} + 5000\sin(-12)\hat{\jmath} = \{4891\hat{\imath} - 1040\hat{\jmath}\}$
Angles are given relative to the line AB. Therefore, $\hat{\imath}$ points towards point A. $\hat{\jmath}$ points to the right of line AB. A negative angle is counter-clockwise or to the left of the line AB.

Solution

Resolve the vectors into their scalar components.

This was done at the top of the problem using sines and cosines.

The resultant force is just the sum of the two forces.

$$\vec{F} = \vec{F_1} + \vec{F_2}$$

$$\vec{F} = \{3864\hat{\imath} + 1035\hat{\jmath}\} + \{4891\hat{\imath} - 1040\hat{\jmath}\} = \{8755\hat{\imath} - 5\hat{\jmath}\}$$

The magnitude of this force is

$$F = \sqrt{(8755)^2 + (-5)^2} = 8755$$

The angle is

$$\theta = \tan^{-1}\left(\frac{F_y}{F_x}\right) = \tan^{-1}\left(\frac{-5}{8755}\right) = -0.03°$$

The negative angle indicates that it is 0.03° to the left of the line AB.

[†]Problem from University Physics by Ling, Sanny and Moebs (OpenStax)