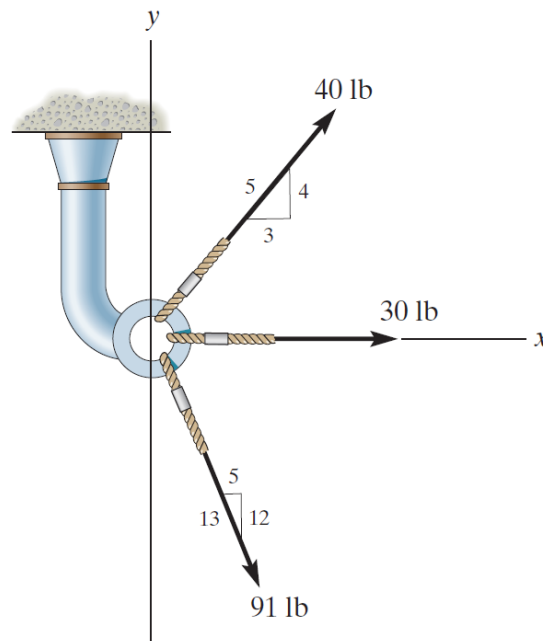
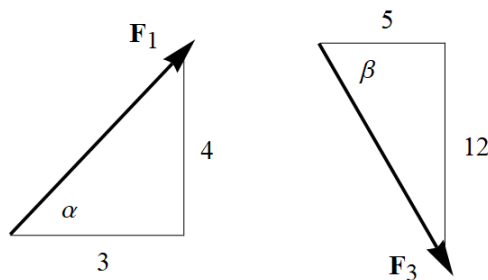


Problem 2-44

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

**Prob. 2-44****Solution**

Begin by finding the angles that the two forces make with the horizontal.



$$\tan \alpha = \frac{4}{3} \rightarrow \alpha = \tan^{-1} \left(\frac{4}{3} \right) \approx 53.1^\circ$$

$$\tan \beta = \frac{12}{5} \rightarrow \beta = \tan^{-1} \left(\frac{12}{5} \right) \approx 67.4^\circ$$

Write each of the forces in component form.

$$\mathbf{F}_1 = 40 \langle \cos \alpha, \sin \alpha \rangle \text{ lb} = 40 \left\langle \frac{3}{5}, \frac{4}{5} \right\rangle \text{ lb} = \langle 24, 32 \rangle \text{ lb}$$

$$\mathbf{F}_2 = 30 \langle 1, 0 \rangle \text{ lb}$$

$$\mathbf{F}_3 = 91 \langle \cos \beta, -\sin \beta \rangle \text{ lb} = 91 \left\langle \frac{5}{13}, -\frac{12}{13} \right\rangle \text{ lb} = \langle 35, -84 \rangle \text{ lb}$$

Add them together to get the resultant force.

$$\begin{aligned} \mathbf{F}_R &= \mathbf{F}_1 + \mathbf{F}_2 + \mathbf{F}_3 \\ &= \langle 24 + 30 + 35, 32 - 84 \rangle \text{ lb} \\ &= \langle 89, -52 \rangle \text{ lb} \end{aligned}$$

Its magnitude is

$$\begin{aligned} |\mathbf{F}_R| &= \sqrt{(89)^2 + (-52)^2} \text{ lb} \\ &\approx 103 \text{ lb}, \end{aligned}$$

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

$$\tan \phi = \frac{-52}{89} \quad \rightarrow \quad \phi = -\tan^{-1} \left(\frac{52}{89} \right) \approx -30.3^\circ.$$

Therefore, the resultant force is 30.3° clockwise from the positive x -axis.