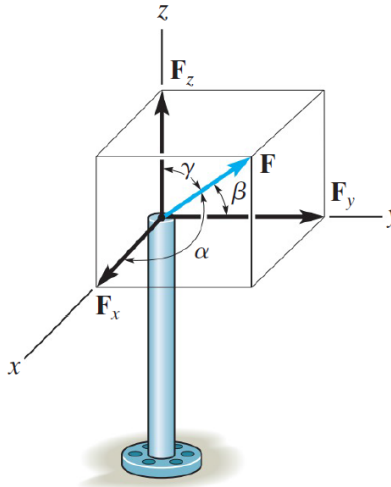


## Problem 2-84

The pole is subjected to the force  $\mathbf{F}$ , which has components acting along the  $x$ ,  $y$ ,  $z$  axes as shown. If the magnitude of  $\mathbf{F}$  is 3 kN,  $\beta = 30^\circ$ , and  $\gamma = 75^\circ$ , determine the magnitudes of its three components.



Probs. 2-84/85

### Solution

Begin by finding  $\alpha$ , the angle that  $\mathbf{F}$  makes with the positive  $x$ -axis. ( $0^\circ < \alpha < 90^\circ$ )

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1 \quad \rightarrow \quad \alpha = \cos^{-1} \left( \pm \sqrt{1 - \cos^2 \beta - \cos^2 \gamma} \right) \approx \{64.7^\circ, 115^\circ\}$$

Write the force in component form.

$$\begin{aligned} \mathbf{F} &= 3000 \langle \cos \alpha, \cos \beta, \cos \gamma \rangle \text{ N} \\ &= \langle 3000 \cos \alpha, 3000 \cos \beta, 3000 \cos \gamma \rangle \text{ N} \\ &\approx \langle 1.28 \times 10^3, 2.60 \times 10^3, 776 \rangle \text{ N} \end{aligned}$$

Therefore, the magnitudes of its components are as follows.

$$|F_x| \approx 1.28 \times 10^3 \text{ N}$$

$$|F_y| \approx 2.60 \times 10^3 \text{ N}$$

$$|F_z| \approx 776 \text{ N}$$