

PROB. 2.93

$T_{AB} = 425 \text{ lb}$, $T_{AC} = 510 \text{ lb}$, FIND $|\vec{R}|$, DIR. ANGLES

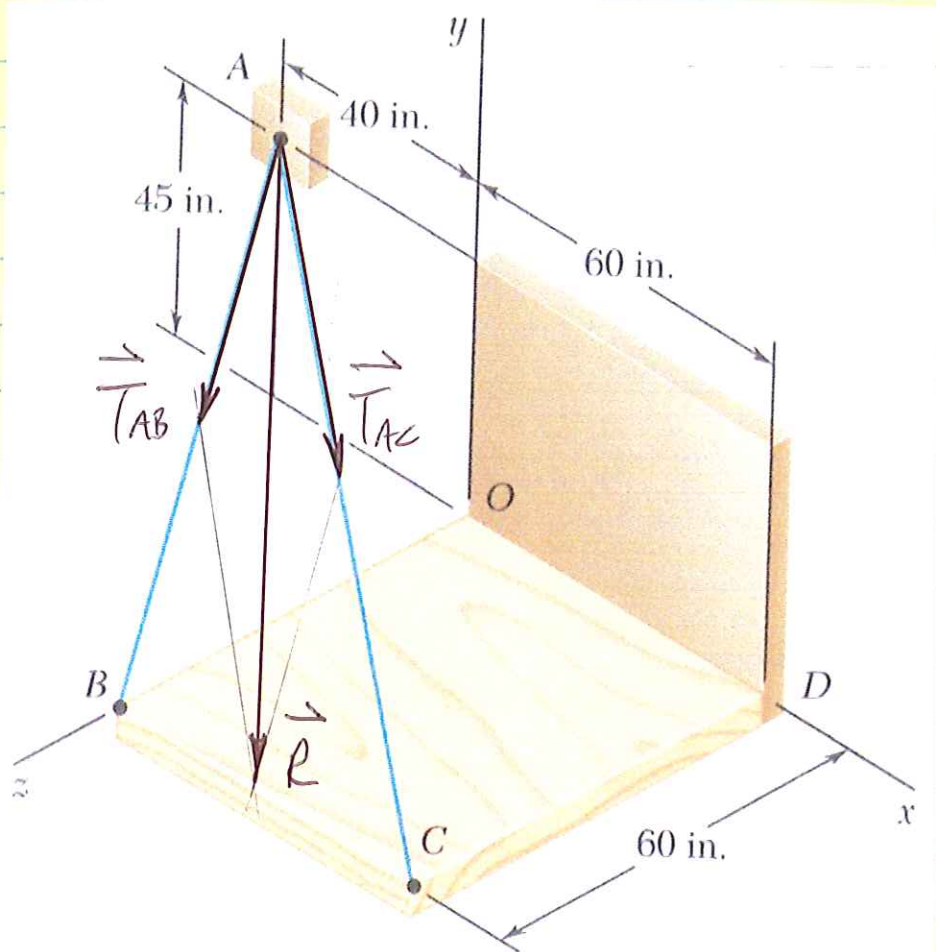


Fig. P2.93 and P2.94

$$\vec{R} = \vec{T}_{AB} + \vec{T}_{AC}$$

LOCATE POINTS: $A(-40, 45, 0)^{\text{in}}$, $B(0, 0, 60)^{\text{in}}$

$C(60, 0, 60)^{\text{in}}$

PROB. 2.93 CONT.

(2)

$$\vec{T}_{AB} : dx = x_B - x_A = 0 - (-40) = 40^{\text{IN}}$$

$$dy = y_B - y_A = 0 - 45 = -45^{\text{IN}}$$

$$dz = z_B - z_A = 60 - 0 = 60^{\text{IN}}$$

$$d = \sqrt{40^2 + 45^2 + 60^2} = 85^{\text{IN}}$$

$$F_x = F \frac{dx}{d} = (425) \left(\frac{40}{85} \right) = 200^{\text{LB}}$$

$$F_y = F \frac{dy}{d} = (425) \left(\frac{-45}{85} \right) = -225^{\text{LB}}$$

$$F_z = F \frac{dz}{d} = (425) \left(\frac{60}{85} \right) = 300^{\text{LB}}$$

$$\vec{T}_{AB} = (200)\hat{i} + (-225)\hat{j} + (300)\hat{k}^{\text{LB}}$$

$$T_{AC} : dx = x_C - x_A = 60 - (-40) = 100^{\text{IN}}$$

$$dy = y_C - y_A = 0 - 45 = -45^{\text{IN}}$$

$$dz = z_C - z_A = 60 - 0 = 60^{\text{IN}}$$

$$d = \sqrt{100^2 + 45^2 + 60^2} = 125^{\text{IN}}$$

$$F_x = F \frac{dx}{d} = (510) \left(\frac{100}{125} \right) = 408^{\text{LB}}$$

PROB. 2.93 CONT.

(3)

$$F_y = F \frac{dy}{d} = (510) \left(\frac{-45}{125} \right) = -183.6 \text{ LB}$$

$$F_z = F \frac{dz}{d} = (510) \left(\frac{60}{125} \right) = 244.8 \text{ LB}$$

$$\vec{T}_{AC} = (408) \hat{i} + (-183.6) \hat{j} + (244.8) \hat{k} \text{ LB}$$

$$\vec{R} = (200 + 408) \hat{i} + (-225 - 183.6) \hat{j} + (300 + 244.8) \hat{k} \text{ LB}$$

$$\vec{R} = (608) \hat{i} + (-408.6) \hat{j} + (544.8) \hat{k} \text{ LB}$$

$$|\vec{R}| = \sqrt{608^2 + 408.6^2 + 544.8^2} = 913 \text{ LB}$$

$$\theta_x = \cos^{-1} \left(\frac{R_x}{R} \right) = \cos^{-1} \left(\frac{608}{913} \right) = 48.2^\circ$$

$$\theta_y = \cos^{-1} \left(\frac{R_y}{R} \right) = \cos^{-1} \left(\frac{-408.6}{913} \right) = 116.6^\circ$$

$$\theta_z = \cos^{-1} \left(\frac{R_z}{R} \right) = \cos^{-1} \left(\frac{544.8}{913} \right) = 53.4^\circ$$