Determine all force components of AD and angles with axes.

**Note:** You are analyzing the force on the pole, the pull or tension on pt. A. Logically: $F_x \rightarrow$ to the right $\hat{i}$

$F_y \downarrow$ down $\hat{j}$

$F_z \rightarrow$ forward $\hat{k}$

Let $BD \perp$ projection onto the horizontal plane, X-Z plane.

$\phi = 42^\circ$ if measured from X-axis.

$\theta_y = \text{measured FROM Y-axis TO the force vector}$

$= 180^\circ - 36^\circ = 144^\circ$

Refer to p. 45 and 46 on

$$F_x = F_h \cos \phi$$

$$F_z = F_h \sin \phi$$

$F_x = F \cos \theta_y = 85 \cos 144^\circ = -68.77 \text{ lb}$

$F_z = F \sin \theta_y = 85 \sin 144^\circ = 49.96 \approx 50 \text{ lb}$

$\therefore F_x = (F \sin \theta_y) \cos \phi = 49.96 \cos 42^\circ = 37.13 \text{ lb}$

$F_z = (F \sin \theta_y) \sin \phi = 49.96 \sin 42^\circ = 33.43 \text{ lb}$

*Check:* $\text{mag.} = \sqrt{F_x^2 + F_y^2 + F_z^2} = \sqrt{(37.13)^2 + (68.77)^2 + (33.43)^2} = 85.003 \text{ lb}$

$$\cos \theta_x = \frac{F_x}{F} \quad \therefore \theta_x = \cos^{-1} \left[ \frac{37.13}{85} \right] = 64.1^\circ$$

$$\cos \theta_y = \frac{F_y}{F} \quad \therefore \theta_y = \cos^{-1} \left[ \frac{-68.77}{85} \right] = 144^\circ$$

$$\cos \theta_z = \frac{F_z}{F} \quad \therefore \theta_z = \cos^{-1} \left[ \frac{33.43}{85} \right] = 66.84^\circ$$