

$$R_x = \sum F_x$$

$$8 \cos 30^\circ = 6 - 4 \sin 15^\circ + F \sin \theta$$

$$1.9635 = F \sin \theta$$

$$R_y = \sum F_y$$

$$8 \sin 30^\circ = 4 \cos 15^\circ + F \cos \theta$$

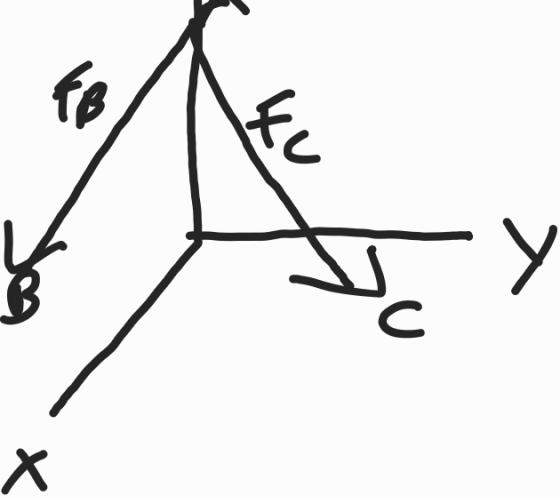
$$0.1363 = F \cos \theta$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{1.9635}{0.1363} = 14.33 = 86.03^\circ$$

$$0.1363 = F \cos \theta$$

$$F = 1.97 \text{ kN}$$

#2



$$\mathbf{r}_{AB} = \{2\mathbf{i} - 3\mathbf{j} - 6\mathbf{k}\}_m$$

$$r_{AB} = \sqrt{2^2 + (-3)^2 + (-6)^2} = 7m \text{ position vector}$$

$$U_{AB} = \frac{2\mathbf{i}}{7} - \frac{3\mathbf{j}}{7} - \frac{6\mathbf{k}}{7} \text{ unit vector}$$

$$F_B = F_B U_{AB} = (700N) \left(\frac{2\mathbf{i}}{7} - \frac{3\mathbf{j}}{7} - \frac{6\mathbf{k}}{7} \right)$$

$$F_B = 200\mathbf{i} - 300\mathbf{j} - 600\mathbf{k} N$$

$$\mathbf{r}_{AC} = \{3\mathbf{i} + 2\mathbf{j} - 6\mathbf{k}\}_m$$

$$r_{AC} = \sqrt{3^2 + 2^2 + (-6)^2} = 7m$$

$$U_{AC} = \frac{3\mathbf{i}}{7} + \frac{2\mathbf{j}}{7} - \frac{6\mathbf{k}}{7}$$

$$F_C = F_C U_{AC} = (560N) \left(\frac{3\mathbf{i}}{7} + \frac{2\mathbf{j}}{7} - \frac{6\mathbf{k}}{7} \right)$$

$$F_C = \{240\mathbf{i} + 160\mathbf{j} - 480\mathbf{k}\} N$$

$$F_R = F_B + F_C = \{440\hat{i} - 140\hat{j} - 1080\hat{k}\} N$$

$$|F_R| = \sqrt{440^2 + (-140)^2 + (-1080)^2}$$

$$= 1174.56 N$$

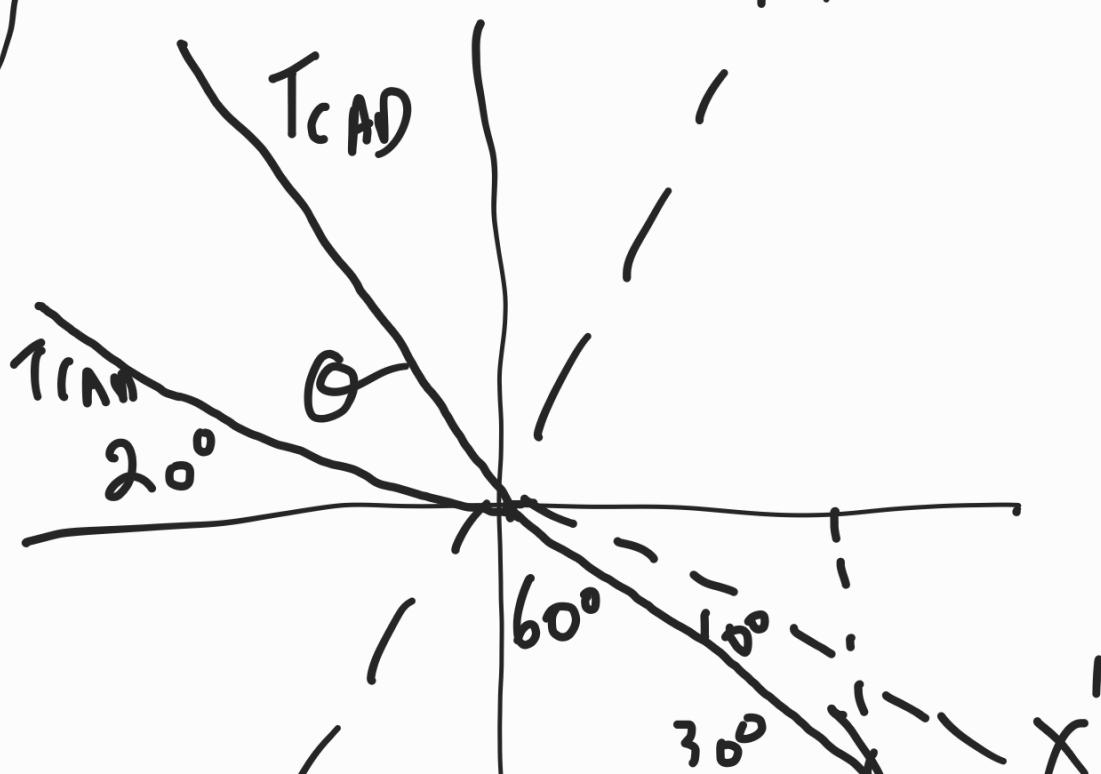
Direction Angles

$$\alpha = \cos^{-1}\left(\frac{440}{1174.56}\right) = 68^\circ$$

$$\beta = \cos^{-1} \left(\frac{-14^{\circ}}{1174.56} \right) = 96.85^{\circ}$$

$$= \cos^{-1} \left(\frac{-1080}{1174.56} \right) = 156.85^\circ$$

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60(lb)

$$\sum F_x = 0$$

$$60 \cos 10^\circ - T \cos \theta = 0$$

$$60 \cos 10^\circ = T(1 + \cos \theta)$$

$$59,0885 = T(2 \cos^2 \frac{\theta}{2})$$

$$\sum F_y = 0$$

$$60 \sin 10^\circ - T \sin \theta = 0$$

$$60 \sin 10^\circ = T \sin \theta$$

$$10.4189 = T(2 \sin \frac{\theta}{2} \cos \frac{\theta}{2})$$

$$\frac{\sum F_y = T(2 \sin \frac{\theta}{2} \cos \frac{\theta}{2})}{\sum F_y = T(2 \sin \frac{\theta}{2} \cos \frac{\theta}{2})} = \frac{10.4189}{59,0885}$$

$$21 \times (\delta \cos \frac{\theta}{2})$$

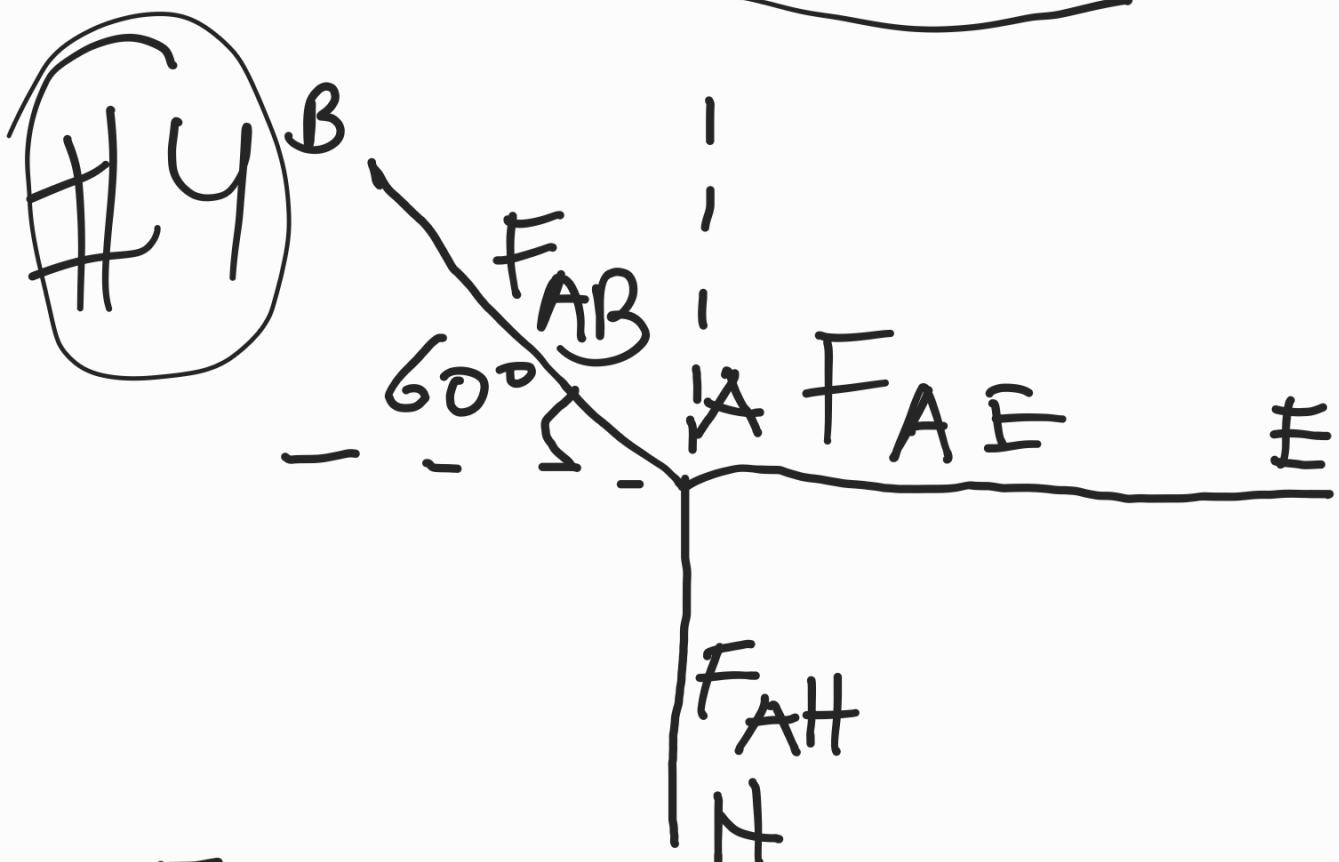
$$\Rightarrow \tan \frac{\theta}{2} = .1763$$

$$\Rightarrow 2 \tan^{-1}(.1763) = 20^\circ = \theta$$

Plug into first equation

$$59.0885 = T(2 \cos^2 10)$$

$$30.4628 = T$$



$$F_{AH} = 30 \text{ kg} \cdot 9.80665 \frac{\text{N}}{\text{kg}}$$

$$F_{AH} = 294.2 \text{ N}$$

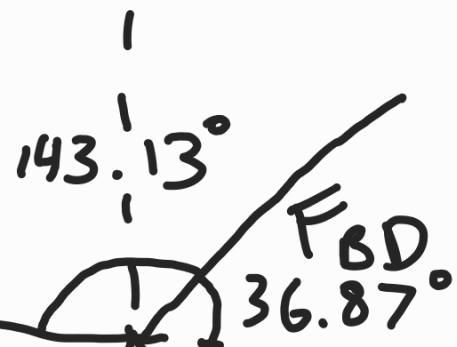
$$\frac{F_{AB}}{\sin 90^\circ} = \frac{F_{AE}}{\sin 150^\circ} = \frac{F_{AH}}{\sin 120^\circ} = 339.7$$

$$F_{AB} = 339.7 (\sin 90^\circ)$$

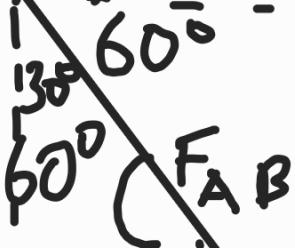
$$F_{AB} = 339.7 \text{ N}$$

$$F_{AE} = 339.7 (\sin 150^\circ)$$

$$F_{AE} = 169.86 \text{ N}$$



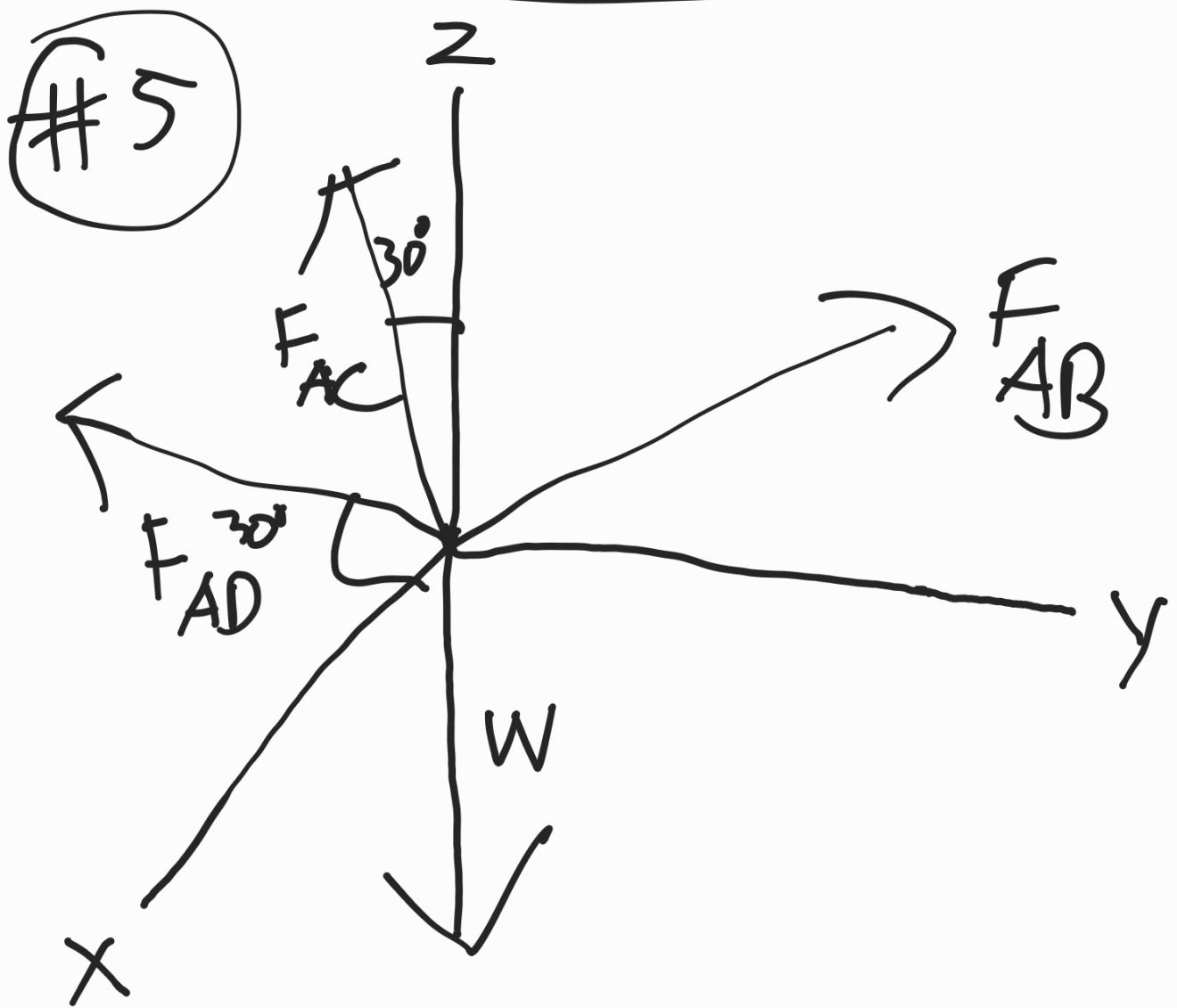
$$\sin^{-1}\left(\frac{3}{5}\right) = 36.87^\circ$$



$$\frac{F_{AB}}{\sin(143.13)} = 566.16 = \frac{F_{BD}}{\sin 120} = \frac{F_{CB}}{\sin 96.87}$$

$$F_{BD} = 566.16(\sin 120) = 490.3 \text{ N}$$

$$F_{CB} = 566.16(\sin 96.87) = 562.1 \text{ N}$$



$$\sum F_x = 0$$

$$F_{AD} \sin 30^\circ - F_{AC} \sin 30^\circ = 0$$

$$F_{AD} = F_{AC}$$

$$\sum F_y = 0$$

$$F_{AB} \cos 45^\circ - 2F_{AD} \cos 45^\circ \sin 60^\circ = 0$$

$$F_{AB} = 2.12 F_{AD}$$

$$F_{AB} = 50N$$

$$50N = 2.12 F_{AD}$$

$$23.58N = F_{AD} = F_{AC}$$

$$\sum F_z = W$$

$$W = 2 F_{AD} \cos 30^\circ \cos 60^\circ + F_{AB} \sin 45^\circ$$

$$W = 2 (23.58) \cos 30^\circ \cos 60^\circ + 50 \sin 45^\circ$$

$$W = 55.78 \text{ N} = 5.69 \text{ kg}$$

