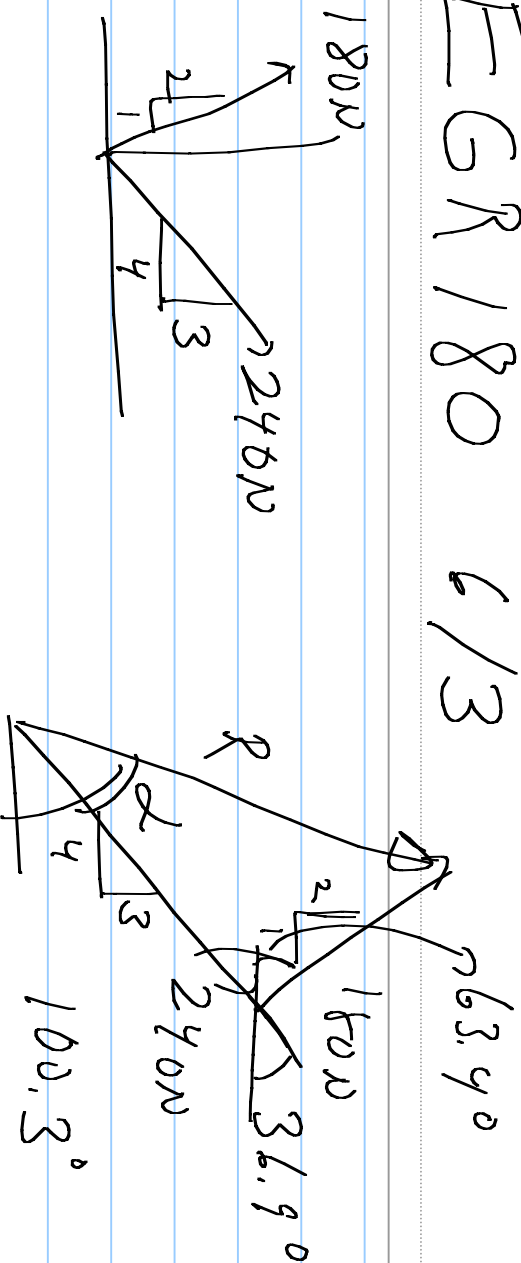


EGR 180 6/3

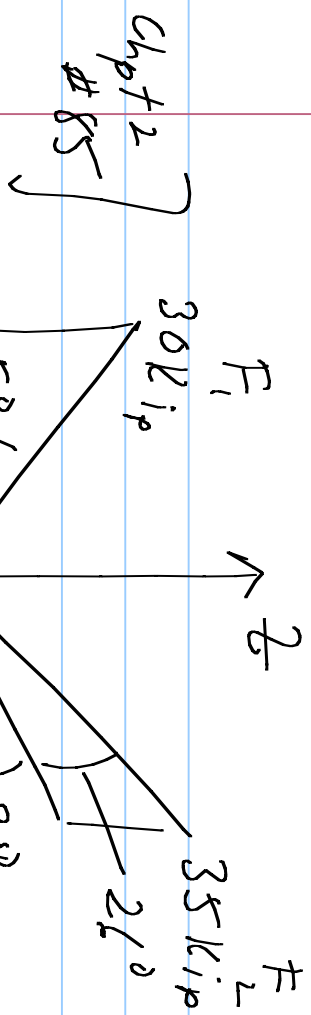
#14
#2



$$R^2 = 240^2 + 180^2 - 2(180)(240) \cos(100.3^\circ)$$

$$R = 324.7 \text{ N}$$

$$\frac{\sin(\alpha)}{180} = \frac{\sin(100.3)}{R} \Rightarrow \alpha = \sin^{-1}\left(\frac{180}{R} \sin(100.3)\right) = 69.9^\circ$$



$$\vec{u} \cdot \vec{v} = |\vec{u}| |\vec{v}| \cos \theta$$

$$\cos \theta = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}| |\vec{v}|}$$

$$F_1 = 30 \cos 50 \cos 30 \hat{i}$$

$$- 30 \cos(50) \sin(30) \hat{j}$$

$$+ 30 \sin(50) \hat{k}$$

$$F_2 = -35 \cos(26) \sin(30) \hat{i}$$

$$+ 35 \cos(26) \cos(30) \hat{j}$$

$$+ 35 \sin(26) \hat{k}$$

$$F_3 = 20 \cos(36) \cos(57) \hat{i}$$

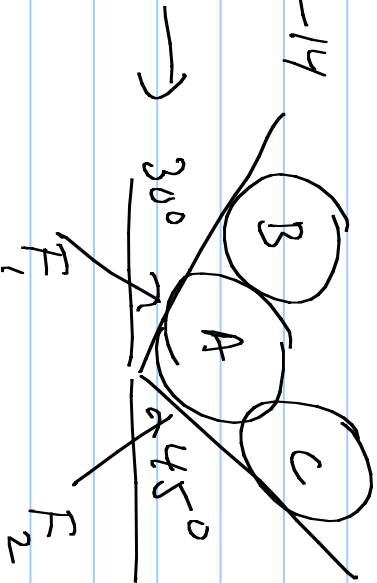
$$+ 20 \cos(36) \sin(57) \hat{j}$$

$$- 20 \sin(36) \hat{k}$$

$$R = \underline{\hspace{2cm}} \hat{i} + \underline{\hspace{2cm}} \hat{j} + \underline{\hspace{2cm}} \hat{k}$$

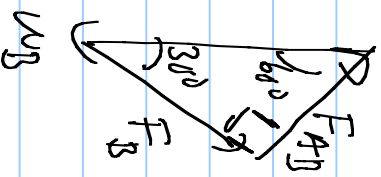
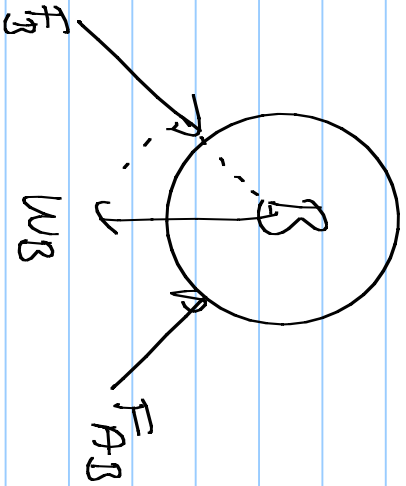
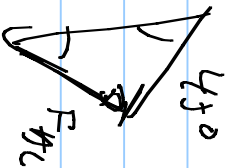
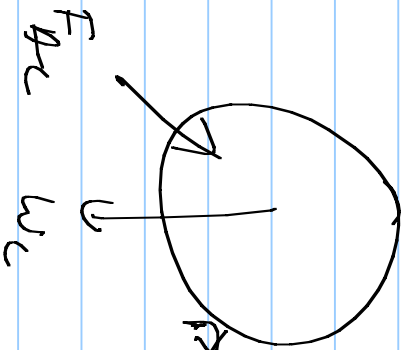
$$R = \underline{42.11} \text{ kips } \theta_x = \underline{76.6}^\circ, \theta_y = \underline{\hspace{2cm}}^\circ, \theta_z = \underline{\hspace{2cm}}^\circ$$

3-14



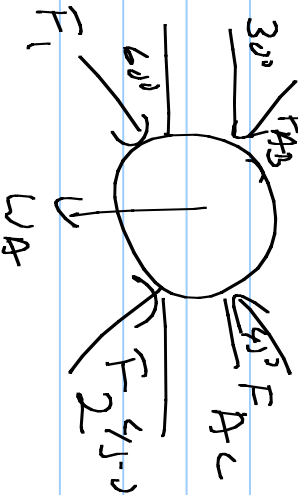
Dia 500 mm
Mass 100 kg

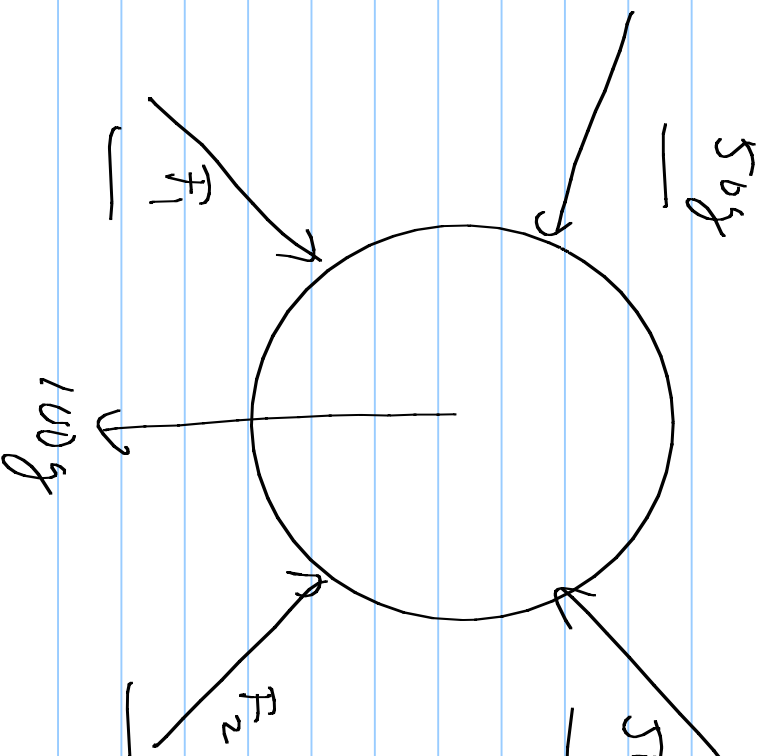
Smooth



$$F_{AB} = \frac{1}{2} W_B = 50g$$

$$F_{Ac} = W_C \sin(45) = 50\sqrt{2}g$$





$$\sum F_x = 50g \cos(30^\circ) - 50\sqrt{2}g \cos(45^\circ)$$

$$+ F_1 \cos(60^\circ) - F_2 \cos(45^\circ)$$

$$= 0$$

$$\frac{1}{2} F_1 - \frac{\sqrt{2}}{2} F_2 = 25\sqrt{3}g - 50g$$

$$\sum F_y = -50g \sin(30^\circ)$$

$$- 50\sqrt{2}g \sin(45^\circ)$$

$$- 100 + F_1 \sin(60^\circ)$$

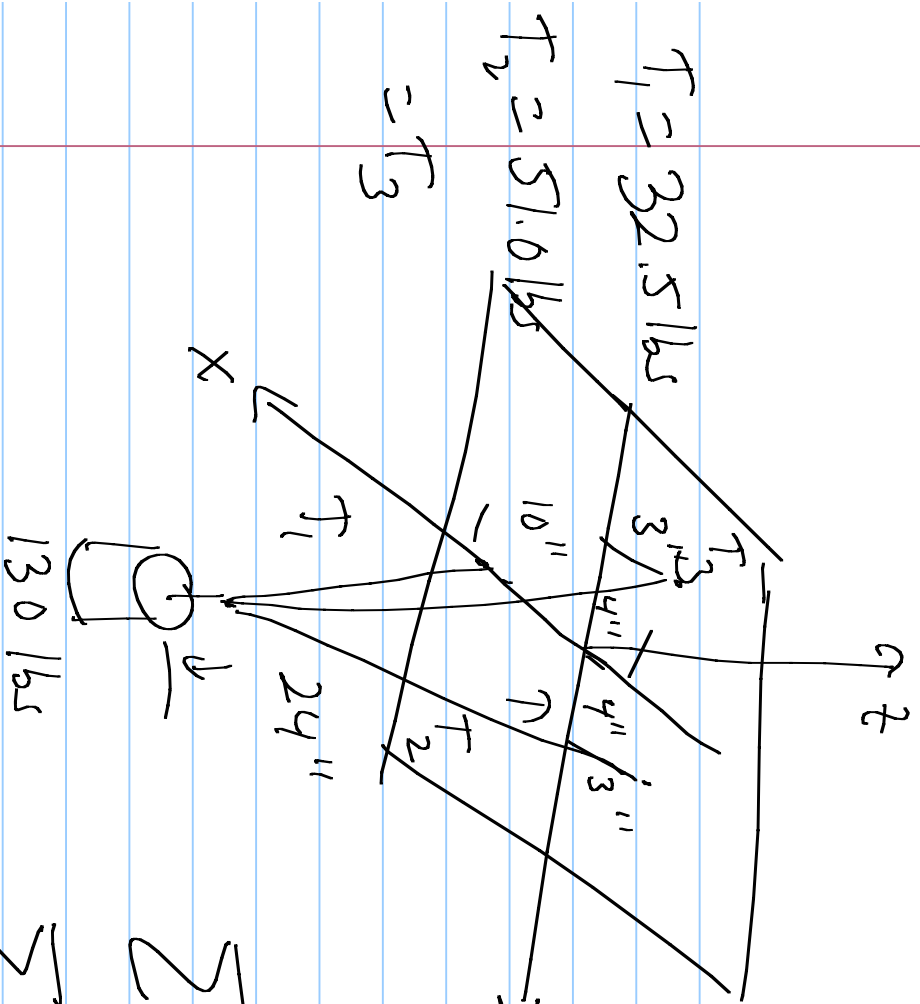
$$+ F_2 \sin(45^\circ) = 0$$

$$\frac{\sqrt{3}}{2} F_1 + \frac{\sqrt{2}}{2} F_2 = 175g$$

$$\left(\frac{1}{2} + \frac{\sqrt{3}}{2}\right) F_1 = 125g + 25\sqrt{3}g$$

$$F_1 = 1209N$$

$$F_2 = 948N$$



$$T_1 = 32.5 \text{ lbs}$$

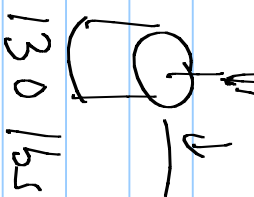
$$T_2 = 51.0 \text{ lbs}$$

$$= T_3$$

$$\vec{T}_1 = (10\hat{i} + 24\hat{k})R_1$$

$$\vec{T}_2 = (-3\hat{i} + 4\hat{j} + 24\hat{k})R_2$$

$$\vec{T}_3 = (-3\hat{i} - 4\hat{j} + 24\hat{k})R_3$$



$$130 \text{ lbs}$$

$$\sum F_x = 10R_1 - 3R_2 - 3R_3 = 0$$

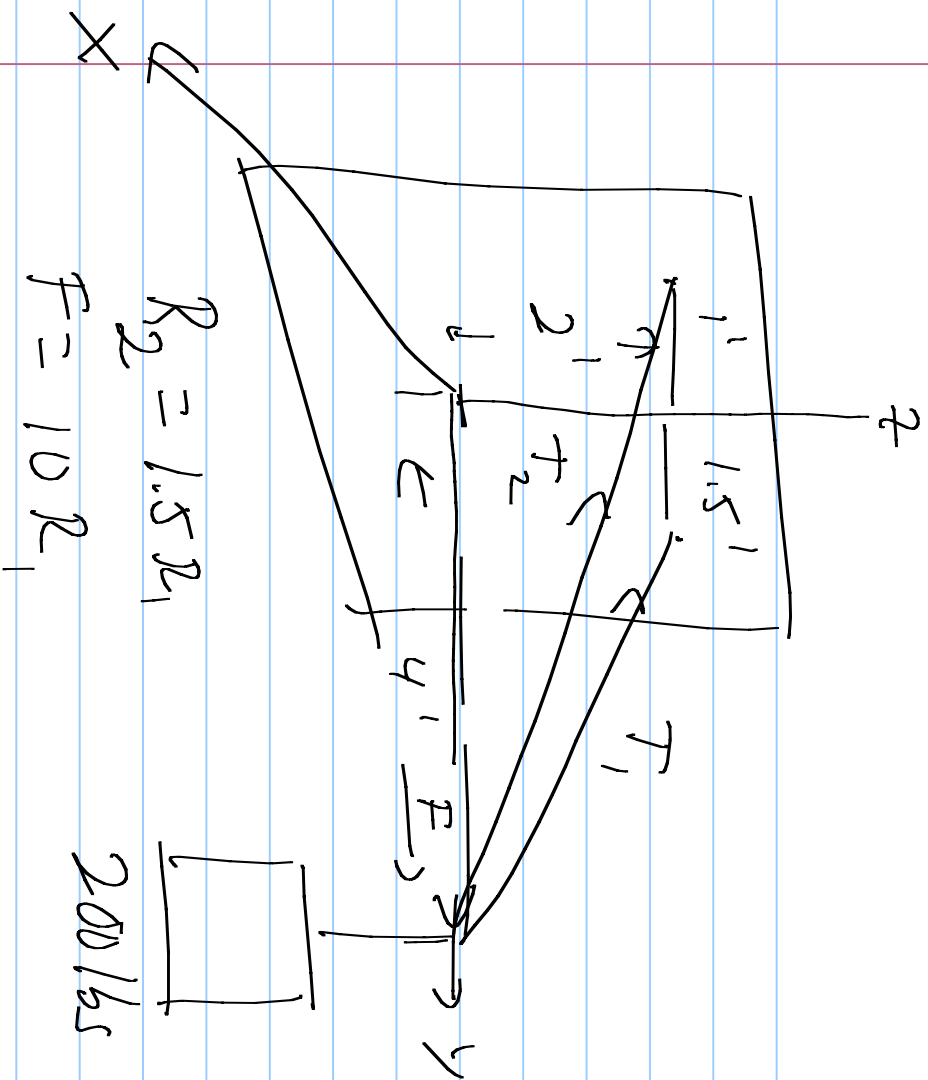
$$R_1 = .6R_2$$

$$\sum F_y = 4R_2 - 4R_3 = 0 \Rightarrow R_2 = R_3$$

$$24[.6 + 1 + 1]R_3 = 130$$

$$\sum F_z = 24R_1 + 24R_2 + 24R_3 - 130 = 0$$

$$R_3 = R_2 = 2.08 \text{ lbs}, R_1 = 1.25 \text{ lbs}$$



$$\vec{T}_1 = (-1.5\hat{i} - 4\hat{j} + 2\hat{k}) R_1$$

$$\vec{T}_2 = (\hat{i} - 4\hat{j} + 2\hat{k}) R_2$$

$$\vec{F} = F\hat{j}$$

$$\sum F_x = -1.5R_1 + R_2 = 0$$

$$\sum F_y = -4R_1 - 4R_2 + F = 0$$

$$\sum F_z = 2R_1 + 2R_2 - 200 = 0$$