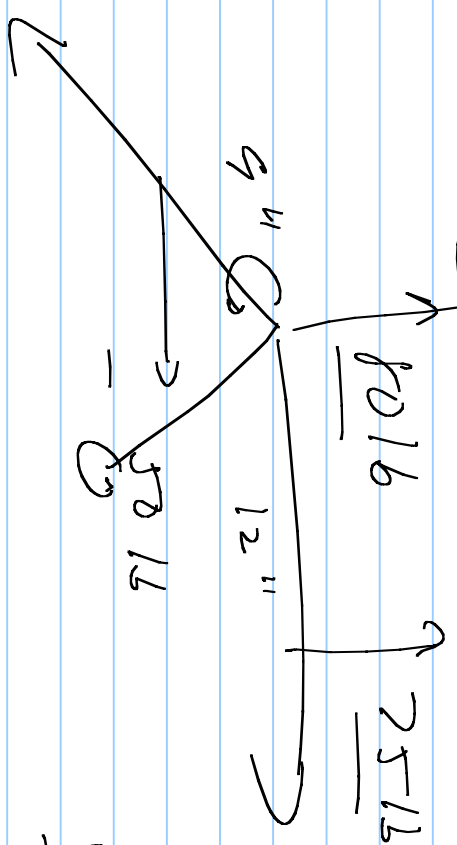


# EGR 180 6/15

4-149)  $\vec{r}_z$



$$\vec{M} = 458 \hat{i} + 800 \hat{j}$$

$$\vec{R} = 509 \hat{i} + 155 \hat{j}$$

$$C_{11} = \hat{R} \cdot \vec{M} = \frac{450 \cdot 155}{\sqrt{50^2 + 155^2}} = 428.3 \text{ in} \cdot \text{lb}$$

$$C_1 = M - C_{11} \vec{R}$$

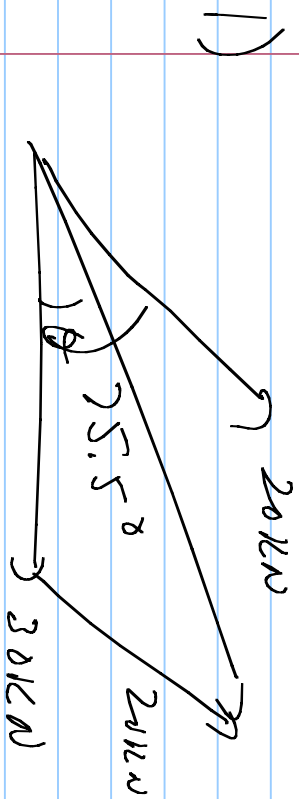
$$= 800 \hat{j} + 450 \hat{i} - 428.3 \left( \frac{50 \hat{i} + 155 \hat{j}}{\sqrt{50^2 + 155^2}} \right)$$

$$= 800 \hat{j} - 131.48 \hat{i} + 42.4 \hat{j}$$

$$C_{11} = C_{11} \cdot \hat{R}$$

$$\hat{R} = \frac{\vec{R}}{|\vec{R}|}$$

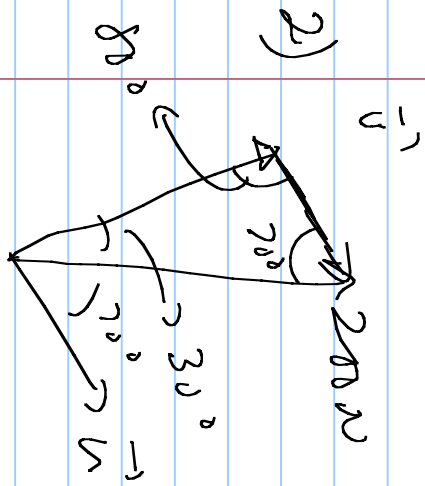
$$(\underline{x}_R \underline{i} + \underline{y}_R \underline{j}) \times \underline{R} = \underline{C}_1$$



$$R = \sqrt{20^2 + 30^2 + 2 \cdot 20 \cdot 30 \cos(75.5)}$$

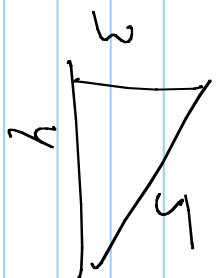
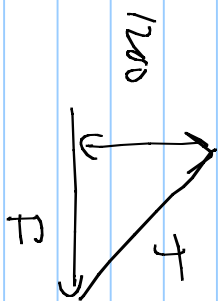
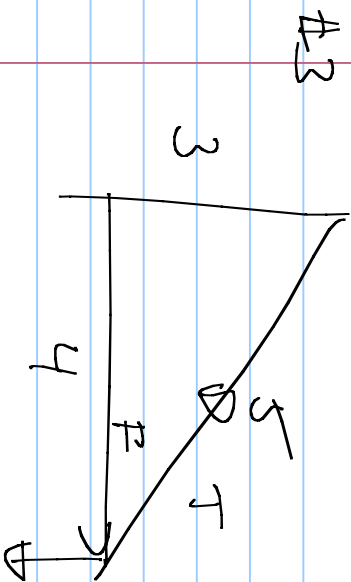
$$= 40.0 \text{ kN}$$

$$\frac{\sin \theta}{20} = \frac{\sin(75.5)}{40.0} \Rightarrow \theta = 26.95^\circ$$



$$\frac{\sin(80)}{200} = \frac{\sin(70)}{U} \Rightarrow U = 200 \frac{\sin(80)}{\sin(70)}$$

$$U = \frac{200 \sin(80)}{\sin(70)} = 190.8 \text{ N} = 101.5 \text{ N}$$

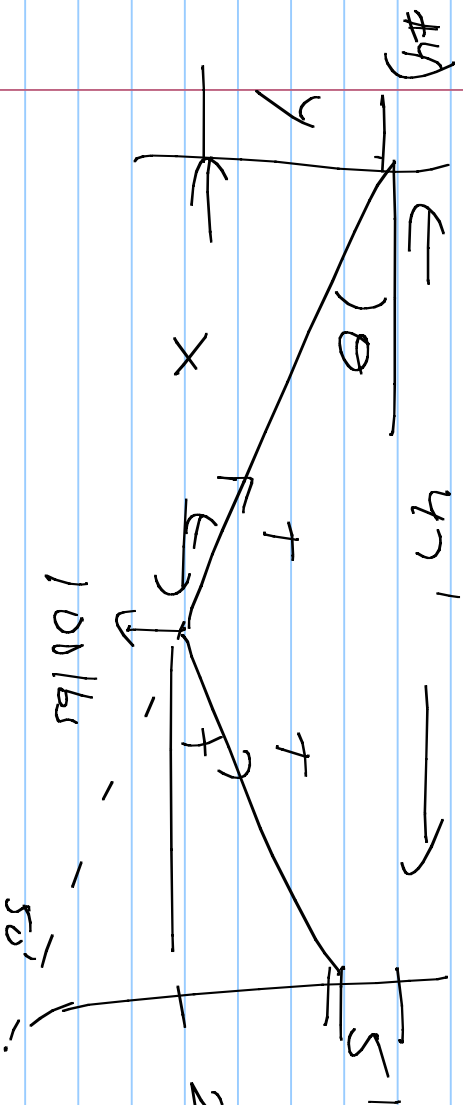


$$\frac{T}{1200} = \frac{5}{3}$$

$$T = 2000 \text{ N}$$

$$1200 \text{ N}$$

$$\frac{F}{1200} = \frac{4}{3} \Rightarrow F = 1600 \text{ N}$$



$$\cos \theta = \frac{47}{51} \Rightarrow \theta = 21.95^\circ$$

$$275.3 \theta = 100 \Rightarrow T = \frac{51}{\sin(19.55)}$$

$$= 146.6 \text{ lbs}$$

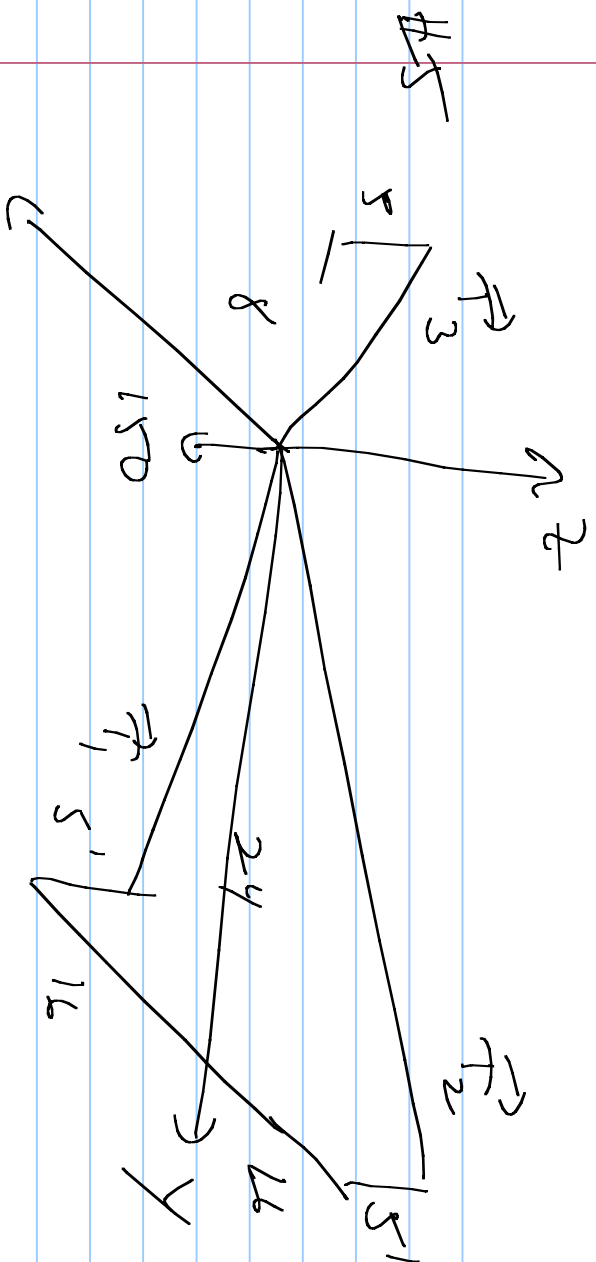
$$\frac{y}{x} = \tan(\theta) \quad \frac{y-5}{47-x} = \tan(\theta)$$

$$y = x \tan(\theta) \quad y-5 = (47-x) \tan(\theta)$$

$$x \tan(\theta) - 5 = 47 \tan(\theta) - x \tan(\theta)$$

$$2x \tan(\theta) = 47 \tan(\theta) + 5$$

$$x = \frac{47 \tan(\theta) + 5}{2 \tan(\theta)} = 30.4'$$



$$\sum F_x = 16R_1 - 16R_2 = 0$$

$$\Rightarrow R_1 = R_2$$

$$\sum F_y = 24R_1 + 24R_2 - 8R_3 = 0$$

$$R_3 = 6R_1$$

$$\sum F_z = 5R_1 + 5R_2 + 30R_3 - 150 = 0$$

$$40R_1 = 150$$

$$R_1 = R_2 = 3.75$$

$$R_3 = 22.5$$

$$T_1 = T_2 = 109.8 \text{ lbs} \quad T_3 = 212.3 \text{ lbs}$$

2D

3D

Moments

Vectors

Resa / part 2D & 3D