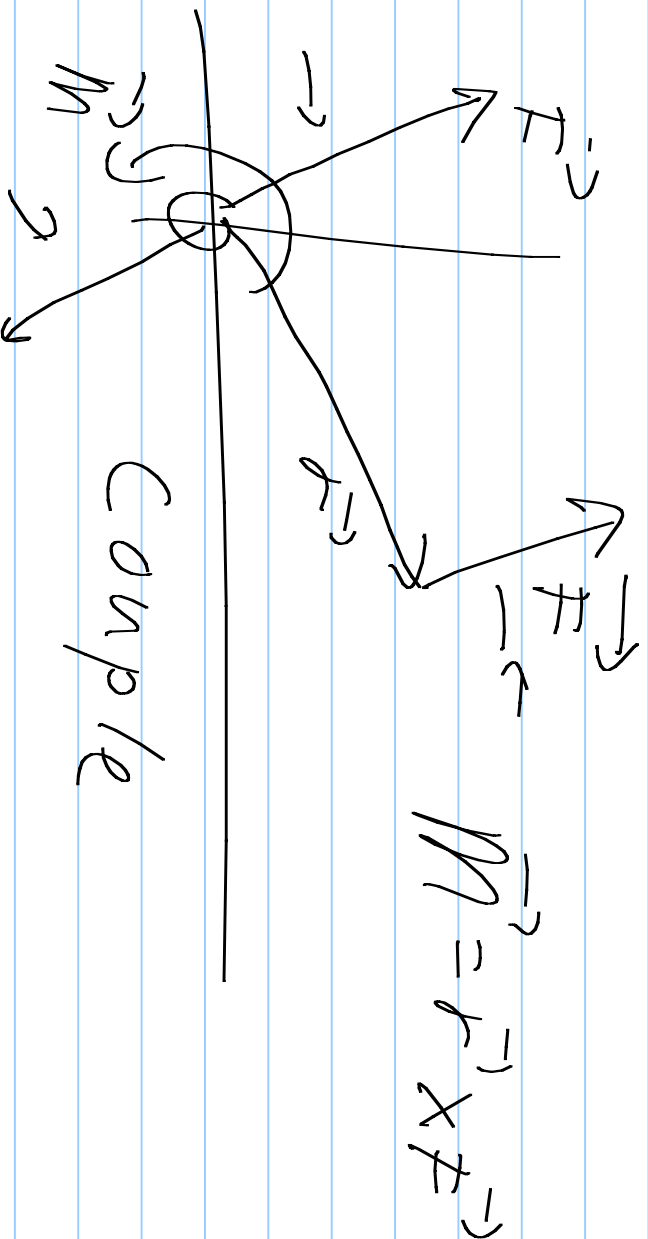
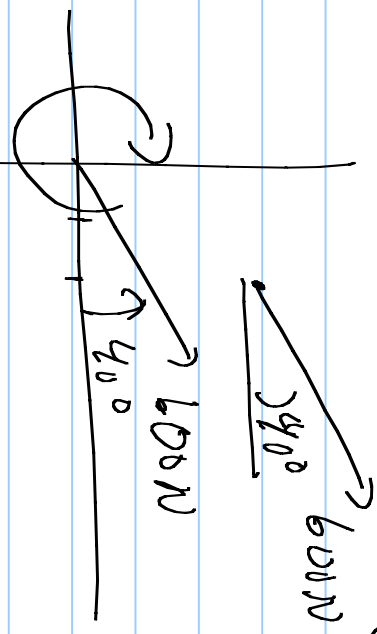


EGR 180 6/10

Resolution of a force into a  
force & a couple



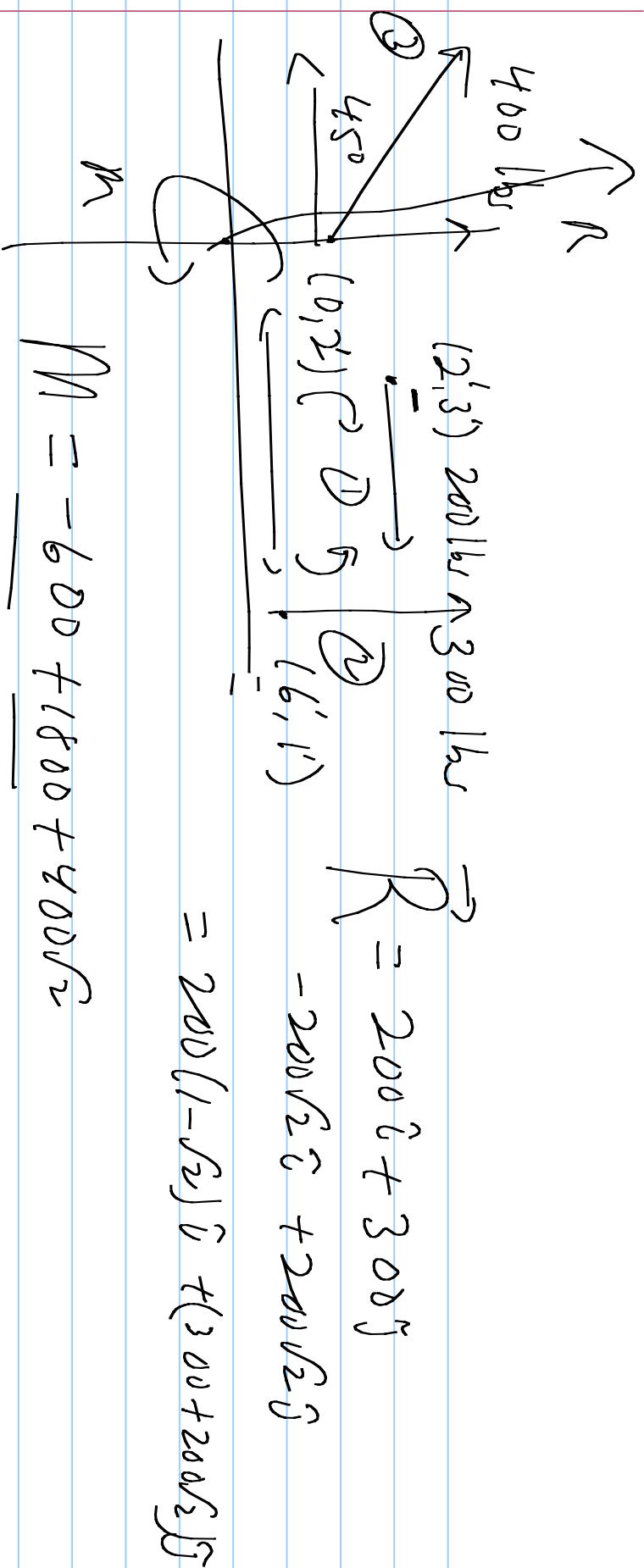
$$\vec{F} = 600\text{ N @ } (2\text{ m}, 3\text{ m}) \angle 40^\circ$$



$$\vec{M} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 3 & 0 \\ 600 \cos 40^\circ & 600 \sin 40^\circ & 0 \end{vmatrix}$$

$$= (1200 \sin 40^\circ - 1800 \cos 40^\circ) \vec{k}$$

$$= -608 \text{ N}\cdot\text{m}$$

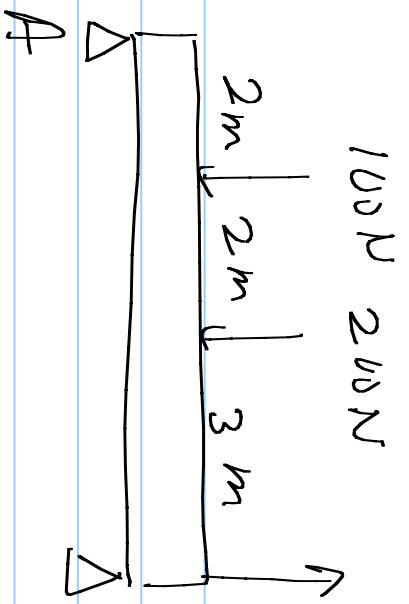


$$\vec{R} = 200\hat{i} + 300\hat{j} - 200\sqrt{2}\hat{i} + 200\sqrt{2}\hat{j} = 200(1-\sqrt{2})\hat{i} + (300+200\sqrt{2})\hat{j}$$

$$M = -600 + 1800 + 400\sqrt{2}$$

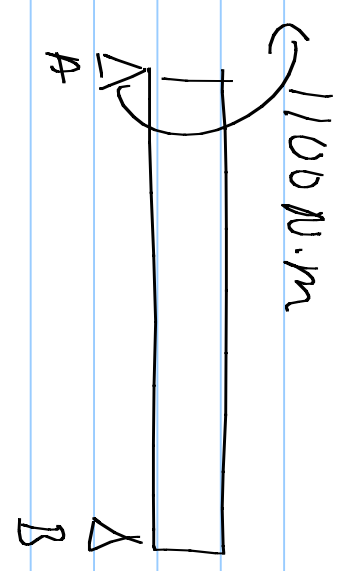
$$\vec{F} = -82.8\hat{i} + 582.8\hat{j} \text{ lbs}$$

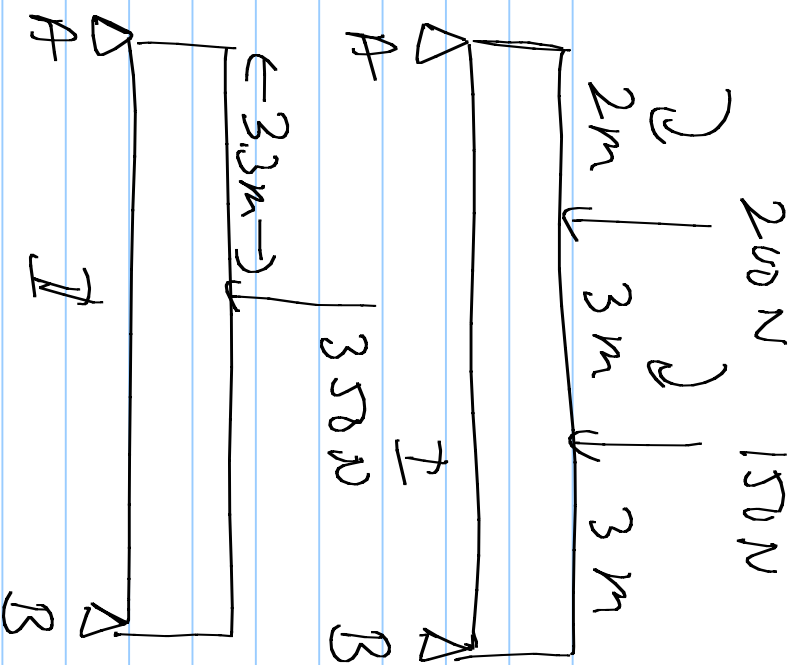
$$M = 1765.7 \text{ ft}\cdot\text{lbs}$$



$$\sum F = -100 - 200 + 300 = 0$$

$$\sum M = -200 - 800 + 2100 = 1100 \text{ N}\cdot\text{m}$$



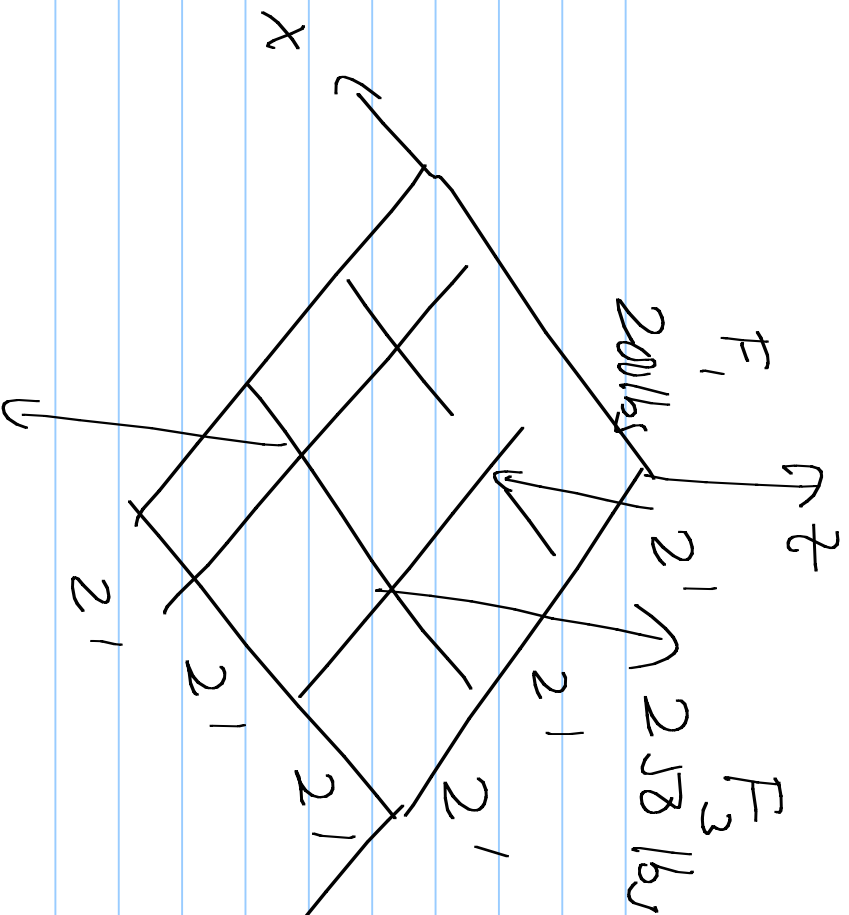


$$\underline{R} = -200 - 150 = -350 \text{ N}$$

$$\underline{M} = -400 - 750 = -1150 \text{ N}\cdot\text{m}$$

$$\frac{M}{R} = d = 3.3 \text{ m}$$

Parallel Force System



$$\sum \vec{F} = \vec{R} = -500 \hat{k} \text{ lbs}$$

$$\sum \vec{M} = \vec{r}_1 \times \vec{F}_1 + \vec{r}_2 \times \vec{F}_2 + \vec{r}_3 \times \vec{F}_3$$

$$= (2\hat{i} + 2\hat{j}) \times (-200\hat{k})$$

$$+ (4\hat{i} + 4\hat{j}) \times (-100\hat{k})$$

$$+ (2\hat{i} + 4\hat{j}) \times (250\hat{k})$$

$$= 400\hat{j} - 400\hat{i} + 400\hat{j} - 400\hat{i} - 500\hat{j} + 1000\hat{i}$$

$$\vec{M} = 200\hat{i} + 300\hat{j}$$

$$\rightarrow M = (x^2 + y^2) x^2 - 50x^2 = \underline{50x^2 - 50y^2}$$

$$-50y = 200$$

$$50x = 300$$

$$y = -4ft$$

$$x = 6ft$$