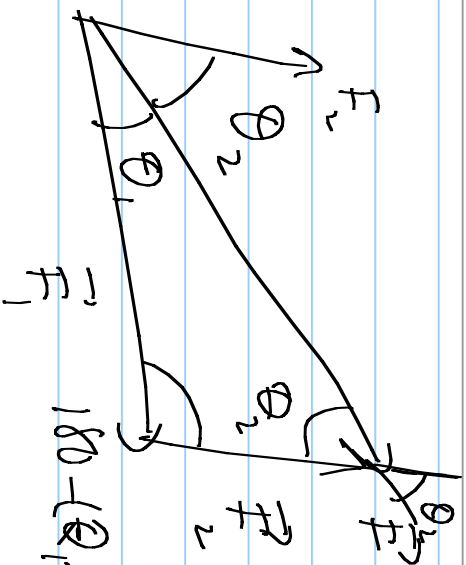


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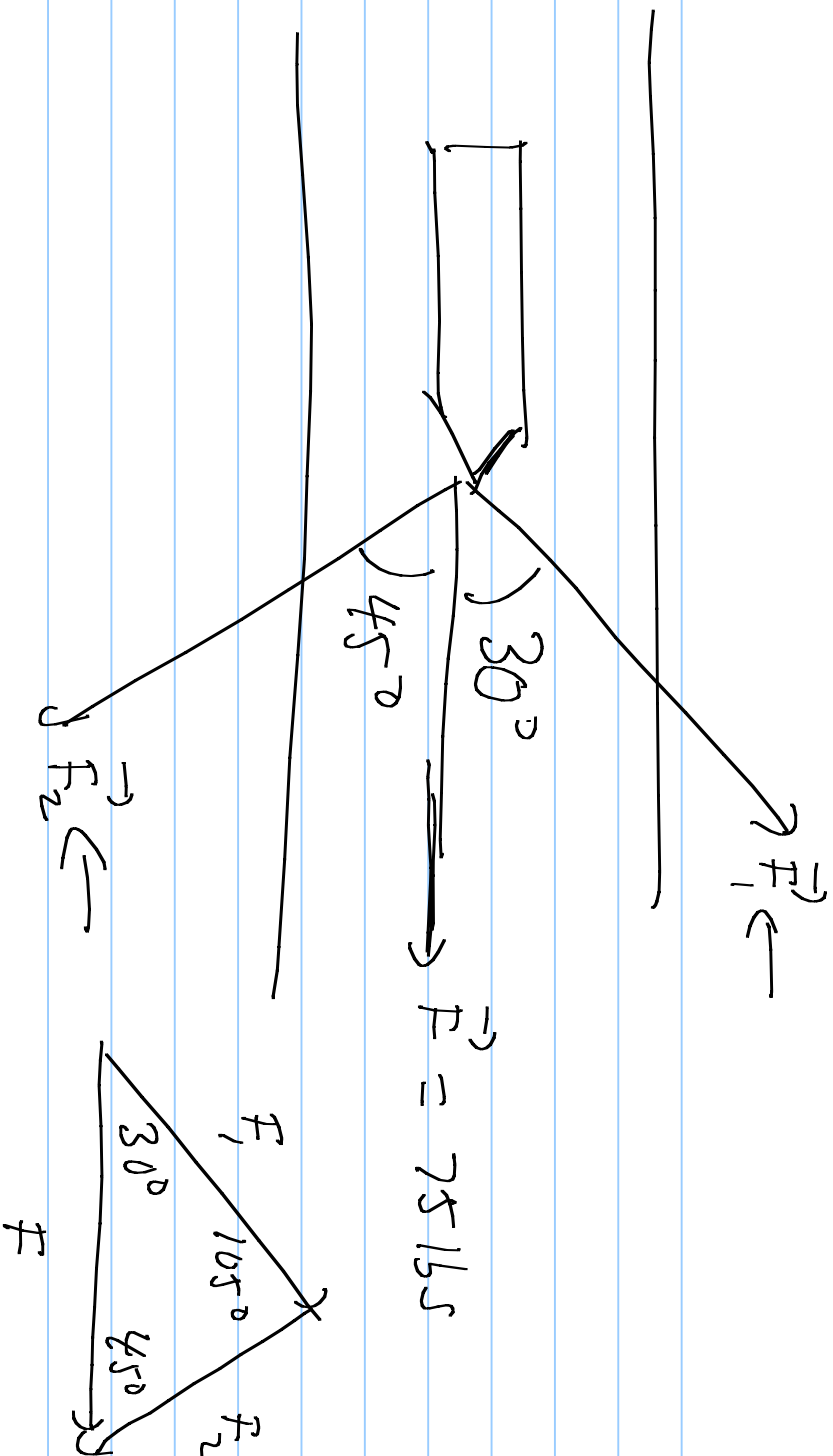
$$\vec{F} = \vec{F}_1 + \vec{F}_2$$

$$F_1 = \frac{F_2}{\sin(\theta_1)} = \frac{F}{\sin(\theta_1 + \theta_2)}$$

$$F_1 = 400 \text{ N}, \theta_1 = 20^\circ, \theta_2 = 40^\circ$$

$$F_1 = F \frac{\sin(\theta_2)}{\sin(\theta_1 + \theta_2)} = 400 \cdot \frac{\sin(40)}{\sin(60)} = 297 \text{ N}$$

$$F_2 = F \frac{\sin(\theta_1)}{\sin(\theta_1 + \theta_2)} = 400 \frac{\sin(20)}{\sin(60)} = 158 \text{ N}$$



$$F_1 = 75 \cdot \frac{\sin(45^\circ)}{\sin(105^\circ)} = 55 \text{ lbs}$$

$$F_2 = 75 \cdot \frac{\sin(30^\circ)}{\sin(105^\circ)} = 39 \text{ lbs}$$

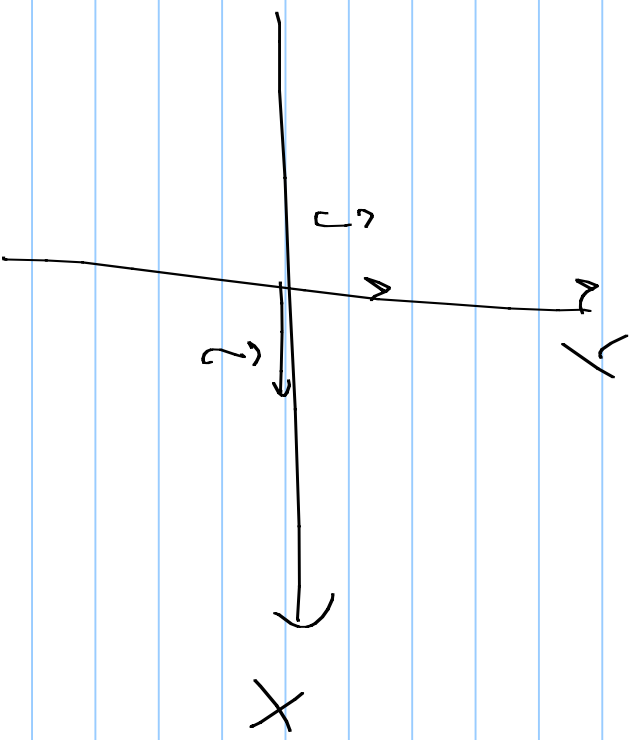
Rectangular Components

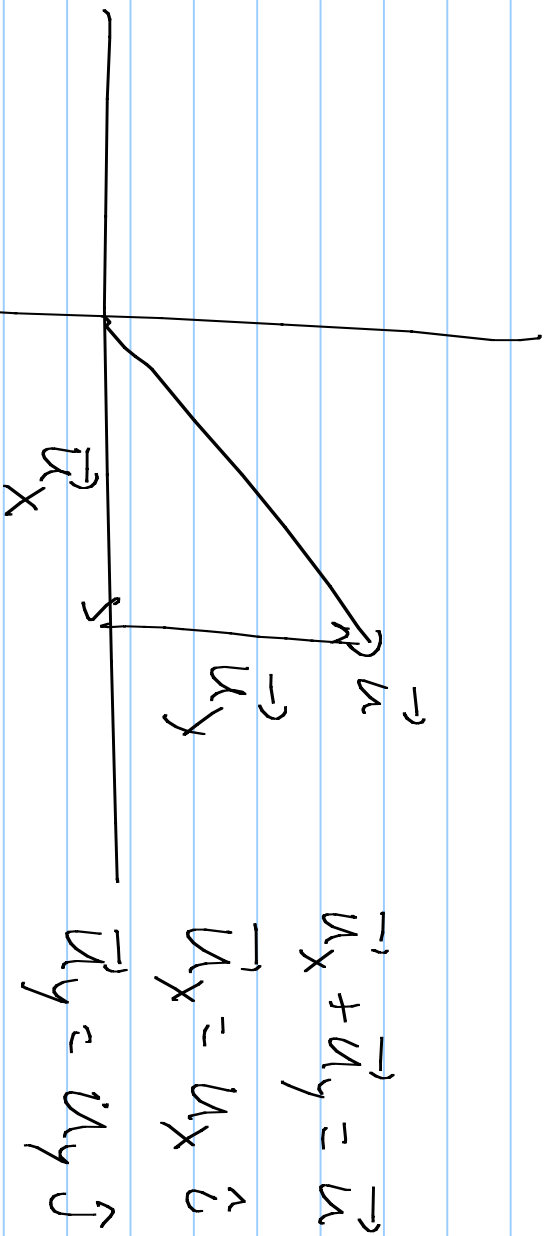
Unit Vector

$$\vec{u} = u \hat{u}$$

$$|\vec{u}| = 1$$

$$\frac{\vec{u}}{|\vec{u}|} = \hat{u} \quad |\hat{u}| = 1$$





$$\vec{u}_x + \vec{u}_y = \vec{u}$$

$$\vec{u}_x = u_x \hat{i}$$

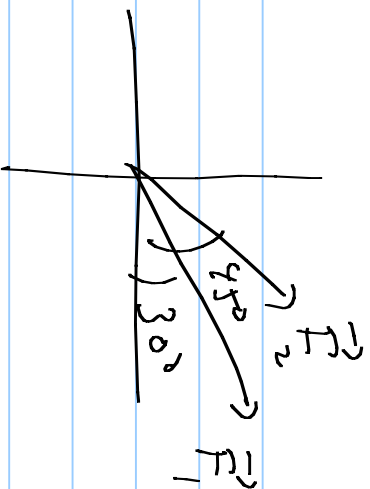
$$\vec{u}_y = u_y \hat{j}$$

$$\vec{u} = u_x \hat{i} + u_y \hat{j}$$

$$\vec{u} = u_x \hat{i} + u_y \hat{j}$$

$$\Rightarrow u + v = (u_x + v_x) \hat{i} + (u_y + v_y) \hat{j}$$

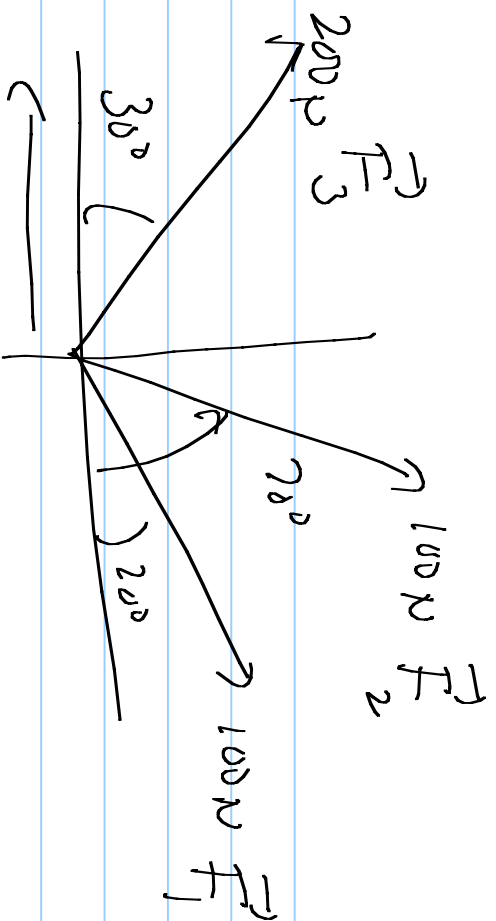
$$\vec{F}_1, 200 \text{ N} \angle 30^\circ$$
$$\vec{F}_2, 150 \text{ N} \angle 60^\circ$$



$$\vec{F}_1 = 200 \cos(30^\circ) \hat{i} + 200 \sin(30^\circ) \hat{j}$$
$$= 100\sqrt{3} \hat{i} + 100 \hat{j}$$

$$\vec{F}_2 = 150 \cos(60^\circ) \hat{i} + 150 \sin(60^\circ) \hat{j}$$
$$= 75 \hat{i} + 75\sqrt{3} \hat{j}$$

$$\vec{R} = \vec{F}_1 + \vec{F}_2 = 248 \hat{i} + 230 \hat{j} \rightarrow 338 \text{ N} \angle 42,8^\circ$$

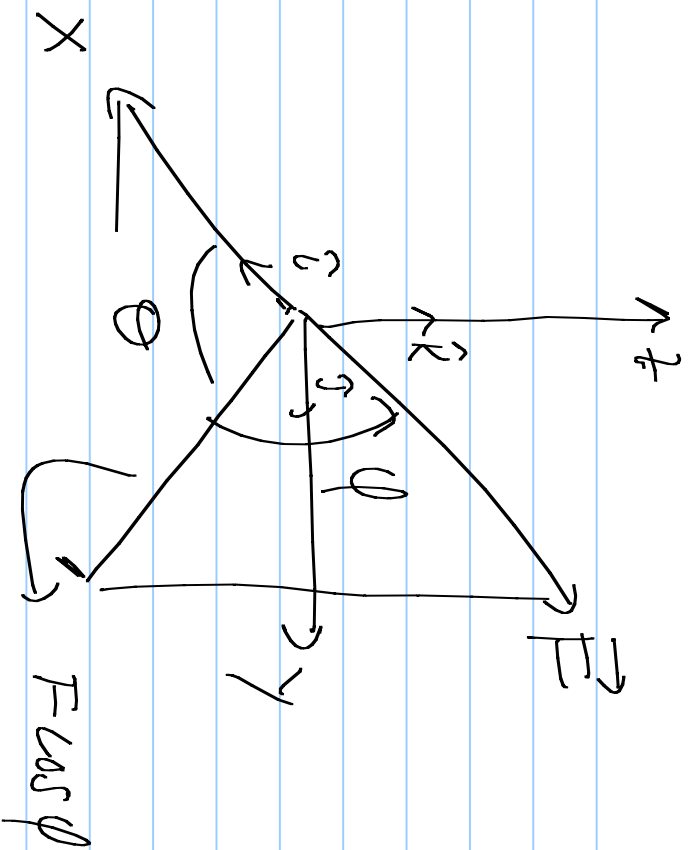


$$\vec{F}_1 = 100 \cos(20) \hat{i} + 100 \sin(20) \hat{j} = 94.0 \hat{i} + 34.2 \hat{j}$$

$$\vec{F}_2 = 100 \cos(78) \hat{i} + 100 \sin(78) \hat{j} = 34.2 \hat{i} + 94.0 \hat{j}$$

$$\vec{F}_3 = -200 \cos(38) \hat{i} + 200 \sin(38) \hat{j} = -173.2 \hat{i} + 100 \hat{j}$$

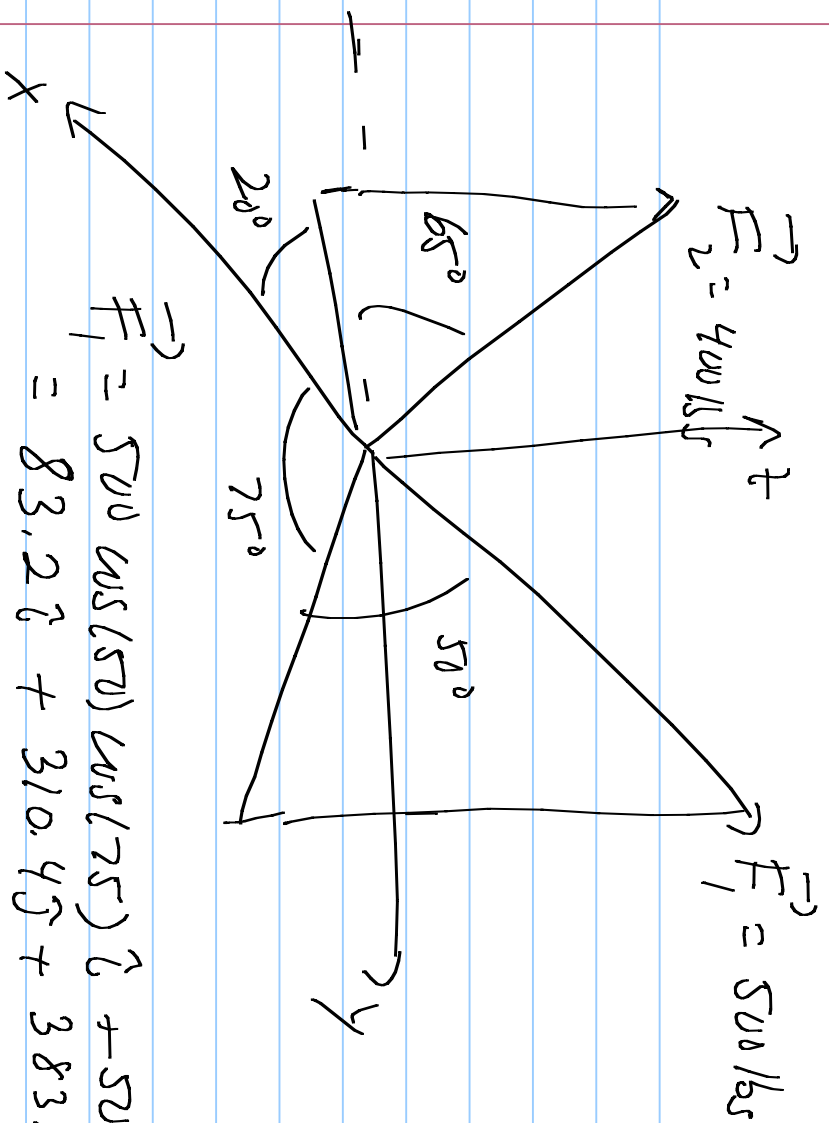
$$\vec{R} = -45.0 \hat{i} + 228.2 \hat{j} \rightarrow 232.6 \text{ N} \angle 101.2^\circ$$



$$\vec{F} = F \cos \phi \hat{i} + F \sin \phi \hat{j} + F \sin \phi \hat{k}$$

$$\phi = 30^\circ, \quad \theta = 45^\circ, \quad F = 1000 \text{ lbs}$$

$$\begin{aligned} \vec{F} &= 1000 \cos(30) \cos(45) \hat{i} + 1000 \cos(30) \sin(45) \hat{j} + 1000 \sin(30) \hat{k} \\ &= 612.4 \hat{i} + 612.4 \hat{j} + 500 \hat{k} \end{aligned}$$



$$\vec{F}_1 = 500 \cos(75^\circ) \hat{i} + 500 \sin(75^\circ) \hat{j} = 83.2 \hat{i} + 310.4 \hat{j} + 383.0 \hat{k}$$

$$\vec{F}_2 = 400 \cos(65^\circ) \hat{i} - 400 \sin(65^\circ) \hat{j} + 400 \sin(65^\circ) \hat{k}$$

$$= 158.9 \hat{i} - 57.8 \hat{j} + 362.5 \hat{k}$$

$$\vec{R} = 242.1 \hat{i} + 252.6 \hat{j} + 745.5 \hat{k}$$

$$|\vec{R}| = 823.5 \text{ lbs}$$