

Aidan Sharpe - Homework 1

1. \vec{F} has magnitude 800N and makes an angle of 35° with the y-axis in the second quadrant.

$$\vec{F}_x = \|\vec{F}\| \sin(-35^\circ) = 800 \times -0.5736 = -458.861$$

$$\vec{F}_y = \|\vec{F}\| \cos(-35^\circ) = 800 \times 0.8192 = 655.322$$

$$\vec{F} = -458.861\hat{i} + 655.322\hat{j}$$

2. The force, \vec{F} , has magnitude 6.6kN and slope is $-\frac{5}{12}$.

$$\theta = \arctan\left(-\frac{5}{12}\right) = -0.3948 = -22.620^\circ$$

$$\vec{F}_x = 6600 \cos(-22.620^\circ) = 6600 \times 0.9231 = 6092.308$$

$$\vec{F}_y = 6600 \sin(-22.620^\circ) = 6600 \times -0.3846 = -2538.462$$

$$\vec{F} = 6092.308\hat{i} - 2538.462\hat{j}$$

3. $F_1 = 500\text{N}$ and $F_2 = 350\text{-N}$. F_1 is in the direction of the x-axis, and F_2 makes an angle 60° with the x-axis.

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

$$\vec{F}_1 = 500\hat{i} + 0\hat{j}$$

$$\vec{F}_2 = 350 \cos(60^\circ)\hat{i} + 350 \sin(60^\circ)\hat{j} = 175\hat{i} + 303.109\hat{j}$$

$$\vec{R} = 675\hat{i} + 303.109\hat{j}$$

$$\theta_R = \arctan\left(\frac{303.109}{675}\right) = 0.4221 = 24.182^\circ$$

4. $F_y = 70\text{lbs}$. The slope of \vec{F} is $\frac{12}{5}$.

$$\frac{F_y}{F_x} = \frac{12}{5}$$

$$70 \times 5 = 12F_x$$

$$F_x = \frac{70 \times 5}{12} = 29.166$$

$$\vec{F} = F_x\hat{i} + F_y\hat{j}$$

$$\|\vec{F}\| = \sqrt{F_x^2 + F_y^2} = \sqrt{29.166^2 + 70^2} = 75.833\text{N}$$

5. \vec{F}_1 has magnitude 2kN and makes an angle 30° with the x-axis. \vec{F}_2 has magnitude 3kN and has slope $-\frac{4}{3}$.

$$\vec{F}_1 = 2000 \cos(30^\circ)\hat{i} + 2000 \sin(30^\circ)\hat{j} = 1732.051\hat{i} + 1000\hat{j}$$

$$\theta_{F_2} = \arctan\left(-\frac{4}{3}\right) = -0.9273 = -53.130^\circ$$

$$\vec{F}_2 = 3000 \cos(\theta_{F_2})\hat{i} + 3000 \sin(\theta_{F_2})\hat{j} = 1800\hat{i} - 2400\hat{j}$$

$$\vec{R} = \vec{F}_1 + \vec{F}_2 = (1732.051 + 1800)\hat{i} + (1000 - 2400)\hat{j} = 3532.051\hat{i} - 1400\hat{j}$$

$$\theta = \arctan\left(-\frac{1400}{3532.051}\right) = -0.3774 = -21.622^\circ$$

$$\|\vec{R}\| = \sqrt{3532.051^2 + (-1400)^2} = 3799.393$$