$F_{12} = F_{21}$

$\vec{F} = 8\ N$

$m = 5\ kg$

$a = \frac{F}{m} = \frac{8}{5} = 1.6\ m/s^2$

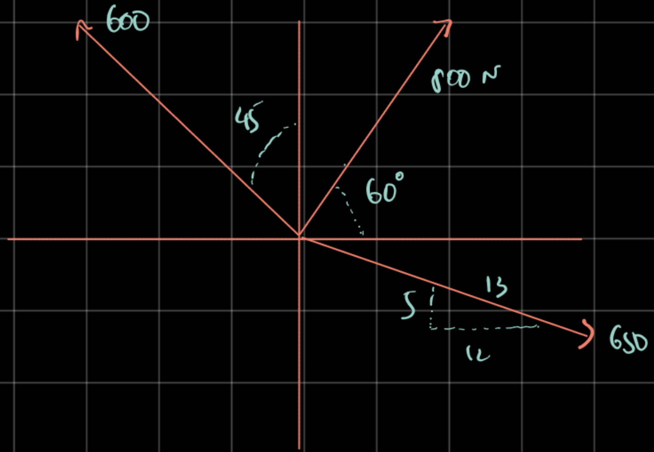
$F_{net} = (m_1 + m_2)\, a$

$5 - 3 = (4a)$

$a = \frac{1}{2}\ m/s^2$

$F_{12} = 5\left(\frac{1}{2}\right) = \frac{5}{2}\ N$

$F_{21} = 3\left(\frac{1}{2}\right) = \frac{3}{2}\ N$



$F_1 = 800 \cos 60 + 800 \sin 60$

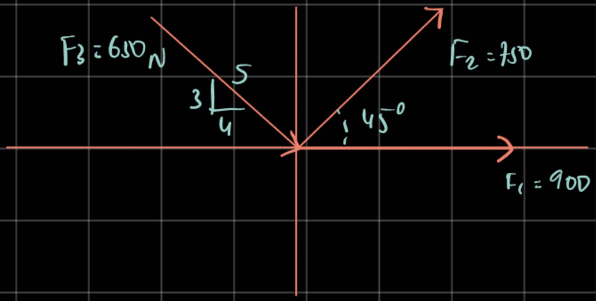
$= 400\hat{i} + 692.82\hat{j}\ N$

$F_2 = -600 \sin 45\ \hat{i} + 600 \cos 45\ \hat{j}$

$= -424.26\hat{i} + 424.26\hat{j}\ N$

$F_3 = \frac{650 \times 12}{13}\hat{i} - \frac{650 \times 5}{13}\hat{j}$

$= 600\hat{i} - 250\hat{j}\ N$



$\Sigma F_x = F_{R_x}$

$F_{R_x} = 900 + 750 \cos 45 + \frac{650 \times 4}{5}$

$= 900 + 530.33 + 520$

$= 1950.33 \text{ N}$

$\Sigma F_y = F_{R_y}$

$F_{R_y} = \frac{-650 \times 3}{5} + 750 \sin 45$

$= 140.33 \text{ N}$

$F_R = \sqrt{(F_{R_x})^2 + (F_{R_y})^2}$

$= 1955.372 \text{ N}$

$\theta = \tan^{-1}\left(\frac{F_{R_y}}{F_{R_x}}\right)$

$= \tan^{-1}\left(\frac{140.33}{1950.33}\right)$

$= 4.116°$

$F_R = 600 \text{ N}$

$F_{R_x} = 600 \cos 45 = 424.26$

$F_{R_y} = 600 \sin 45 = 424.26$

$\Sigma F_x = F_{R_x}$

$424.26 = F_1 \cos \phi + 500 \cos 45 - \frac{650 \times 3}{5}$

$F_1 \cos \theta = 460.71 \text{ N}$

$\Sigma F_y = F_{Ry}$

$424.26 = F_1 \sin\phi - 500 \sin 45 + \frac{650 \times 4}{5}$

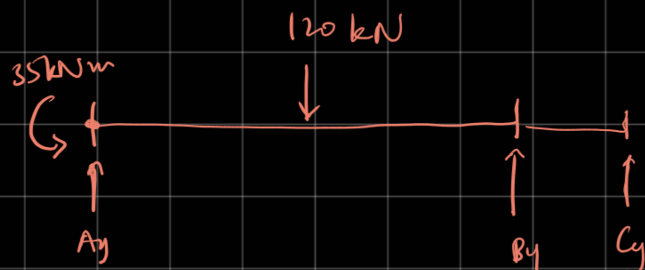
$F_1 \sin\phi = 257.81$

$F_1 = \sqrt{(257.81)^2 + (460.71)^2}$

$F_1 = 527.94$ N

$\phi = \tan^{-1}\left(\frac{F_{1y}}{F_{1x}}\right) = \tan^{-1}\left(\frac{257.81}{460.71}\right)$

$= 29.23°$



$x = 0$

$\Sigma F_y = 0$

$A_y + C_y = 120$

$\Sigma M_A = 0$

$35 = (120)(3) - C_y(7.5)$

$35 - 360 = -C_y(7.5)$

$C_y = \frac{325}{7.5}$

$= 43.33$ N

$\int P(x) = -20$

$\int V(x) = -20x + 76.67 \rightarrow$ Shear

$M(x) = -10x^2 + 76.67x - 35$

Moment

$\Sigma F_y = 0$

$A_y - 120 + C_y = 0$

$A_y = 120 - 43.33$

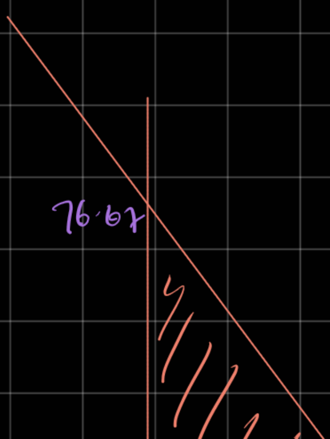
$= 76.67$ N

$\int P(x) = -20$

$\int V(x) = -20x + 76.67$

$-20x + 76.67 = 0$

$x = \frac{76.67}{20}$



$= 3.83\,m$

$x = 0,\ x \quad x = \text{last}$

$-\frac{20x^2}{2}$

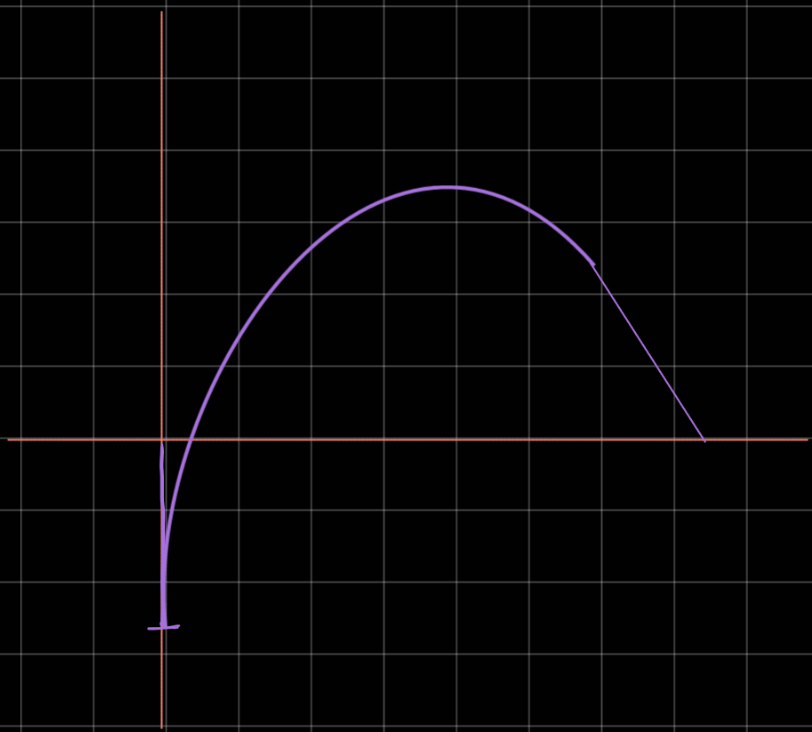
$M(x) = -10x^2 + 76.67x - \underline{35}$

Vertex $= \frac{-76.67}{-20} = 3.83$

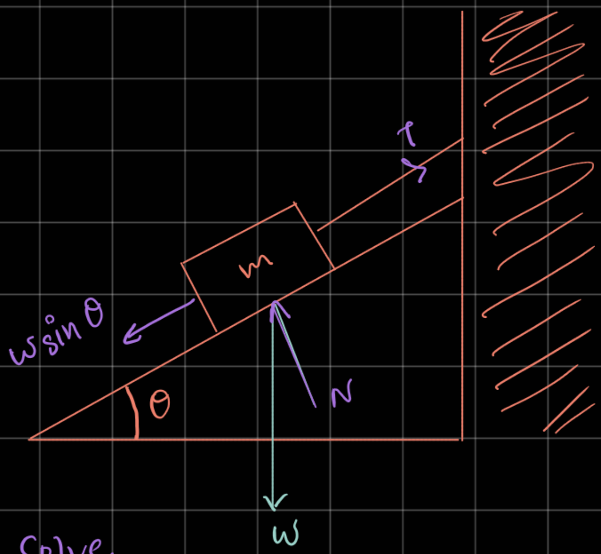
$-b/2a$

$M(3.83) =$

$x = 6$



1. Define
2. Data
3. Theory
4. Estimate
5. Solve
6. Verify



1. Define

$T = ?$

$N = ?$

$a = ?$

3. Theory

5. Solve

$T\ \sin(\theta) = mg$

$T\ \sin 30 = 8 \times 9.81$

$T = 4 \times 9.81$

$= 39.24\ N$

2. Data

$m = 8\,kg$

4. Estimate

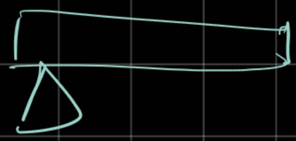
$N = W\cos\theta$

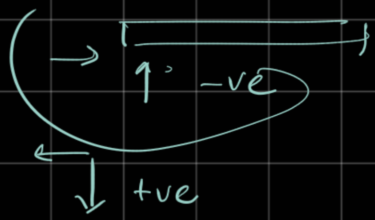
$\theta = 30^\circ$

$= 8 \times 9.81 \times \frac{\sqrt{3}}{2}$

$= 67.9$

$a = \frac{39.2}{8} = 4.9\ m/s^2$





$A = (0, -60, 0)$

$B = (-36, 0, -27)$

$C = (0, 0, 32)$

$D = (40, 0, -27)$

$\vec{AB} = (-36, 60, -27)$

$\vec{AC} = \langle 0, 60, 32 \rangle$

$\vec{AD} = \langle 40, 60, -27 \rangle$

$U_{AB} = \frac{1}{75} \langle -36, 60, -27 \rangle = \langle 0.48, 0.8, -0.36 \rangle$

$U_{AC} = \frac{1}{68} \langle 0, 60, 32 \rangle = \langle 0, 0.89, 0.47 \rangle$

$U_{AD} = \frac{1}{77} \langle 40, 60, -27 \rangle = \langle 0.52, 0.78, 0.35 \rangle$

$F_{AB} = 375 \langle 0.48, 0.8, -0.36 \rangle$

$= 180\hat{i} + 300\hat{j} - 135\hat{k}$

$F_{AC} = F_{AC} \langle 0, 0.89, 0.47 \rangle = 0.89 F_{AC} \hat{j} + 0.47 F_{AC} \hat{k}$

$F_{AD} = F_{AD}\langle 0.52 + 0.78 + 0.35\rangle = 0.52 F_{AD}\hat{i} + 0.78 F_{AD}\hat{j} + 0.35 F_{AD}\hat{k}$

x - axis

$$180 = 0.52 F_{AD}$$

$$F_{AD} = 346.15 \text{ N}$$

z- axis

$F_{AC} = F_{AB} + F_{AD}$

$$0.47 F_{AC} = 135 - 0.35\left(\frac{180}{0.52}\right)$$

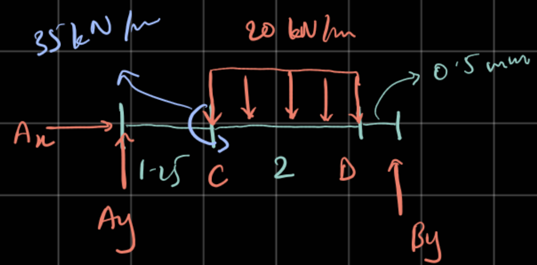
$$F_{AC} = \frac{1}{0.47}\left(-135 + 0.35\left(\frac{180}{0.52}\right)\right)$$

$$= 29.46 \text{N}$$

$$W = 300 + 296.2164$$

$$= 596.22$$

$$= 596.22 \text{ kg}$$



$\Sigma F_x = 0$

$A_x = 0$

$\Sigma M_A = 0$

$$(1.25)(35) + (3.75) B_y - (40)(3.25) = 0$$

$$B_y = 23 \text{ N}$$

$$A_y - 40 + B_y = 0$$

$$A_y = 40 - 23$$

$$= 17 \text{ N}$$

$P(x) = 20$

$V(x) = 20x + 17$