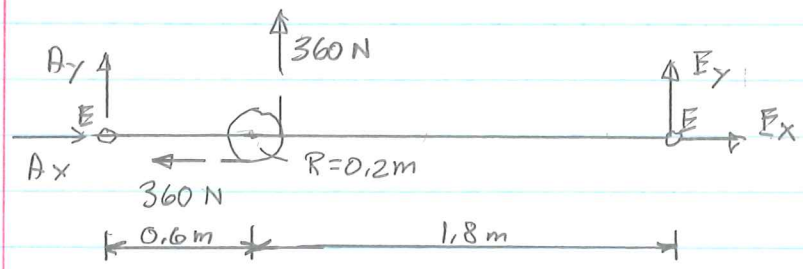
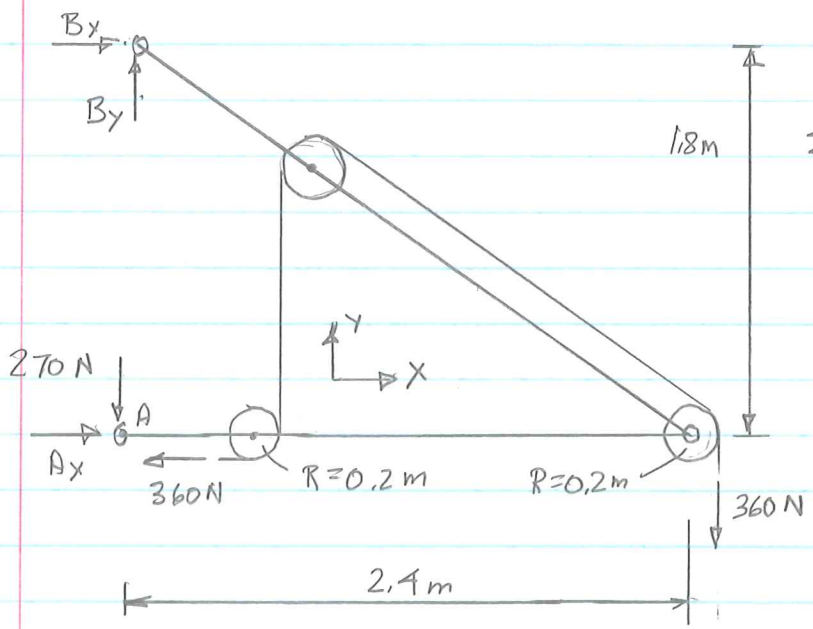
# HW #7 Solution

7.15




$$\Sigma M_A = -360N \cdot 1,6m - 360N \cdot 0,2m - A_y \cdot 2,4m = 0$$

$$\Rightarrow A_y = -270\,N$$

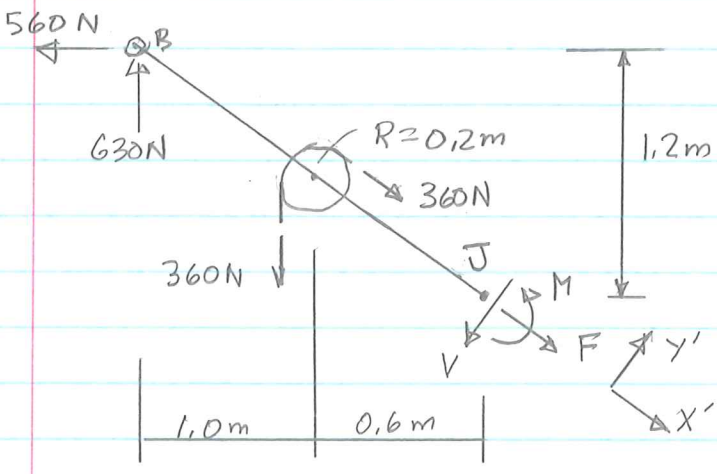



$$\Sigma M_A = -B_x \cdot 1,8m - 360N \cdot 2,6m - 360N \cdot 0,2m = 0$$

$$\Rightarrow B_x = -560\,N$$

$$\Sigma F_y = B_y - 270N - 360N = 0$$

$$\Rightarrow B_y = 630\,N$$




$$\Sigma F_{x'} = F + 360N + 360N \cdot \tfrac{3}{5} - 630N \cdot \tfrac{3}{5} - 560N \cdot \tfrac{4}{5} = 0$$

$$\Rightarrow \boxed{F = 250\,N\ (T)}$$

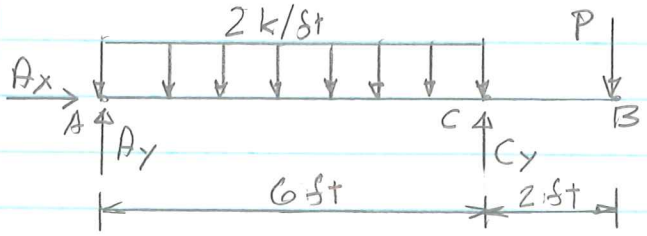
$$\Sigma F_{y'} = -V - 360N \cdot \tfrac{4}{5} + 630N \cdot \tfrac{4}{5} - 560N \cdot \tfrac{3}{5} = 0$$

$$\Rightarrow \boxed{V = -120\,N}$$

$$\Sigma M_J = M - 360N \cdot 0,2m + 360N \cdot 0,8m - 630N \cdot 1,6m + 560N \cdot 1,2m = 0$$

$$\Rightarrow \boxed{M = 120\ N\text{-}m\ \circlearrowleft}$$

7.82



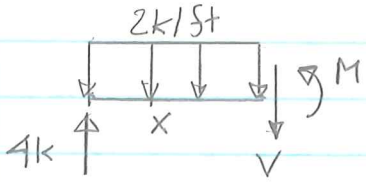

$\Sigma F_x = A_x = 0$

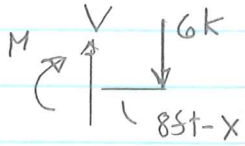
$\Sigma M_A = -12k \cdot 3ft + C_y \cdot 6ft - P \cdot 8ft = 0$

$\Rightarrow C_y = 6k + \frac{4}{3}P$

$\Sigma M_C = -A_y \cdot 6ft + 12k \cdot 3ft - P \cdot 2ft = 0 \Rightarrow A_y = 6k - \frac{1}{3}P$

(a) $P = 6k$



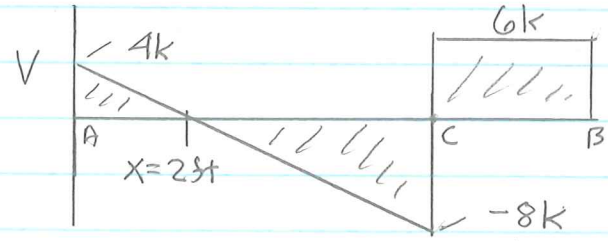




$\Sigma F_y = 0 \Rightarrow V = 4k - 2k/ft \cdot x$

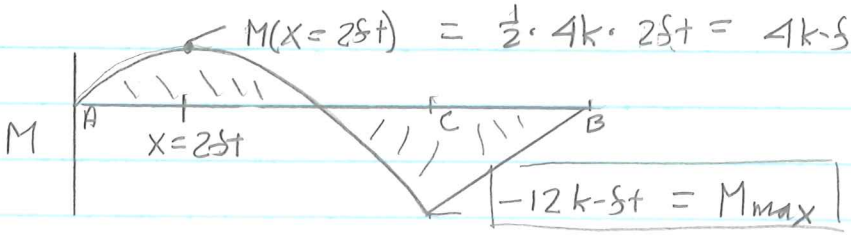
$\Sigma M_{cut} = 0 \Rightarrow M = 4k \cdot x - 2k/ft \cdot \frac{x^2}{2}$

$\Sigma F_y = 0 \Rightarrow V = 6k$

$\Sigma M_{cut} = 0 \Rightarrow M = -6k \cdot (8ft - x)$

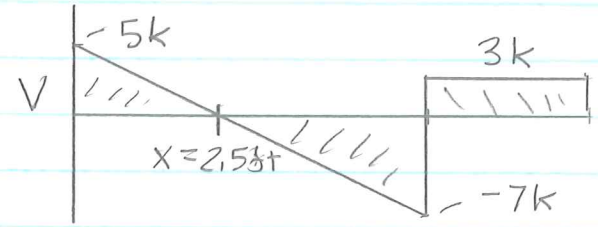



$M(x=2ft) = \frac{1}{2} \cdot 4k \cdot 2ft = 4k\text{-}ft$

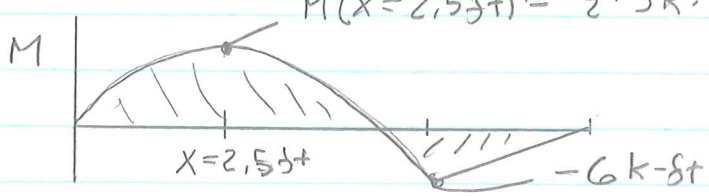



$\boxed{-12\,k\text{-}ft = M_{max}}$

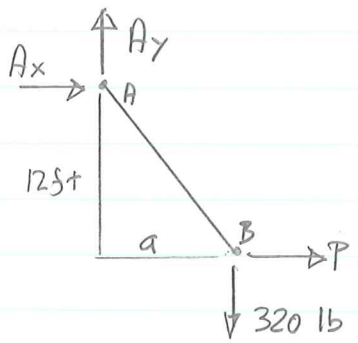
(b) $P = 3k$ (as above)




$M(x=2,5ft) = \frac{1}{2} \cdot 5k \cdot 2,5ft = \boxed{6,25\ k\text{-}ft = M_{max}}$

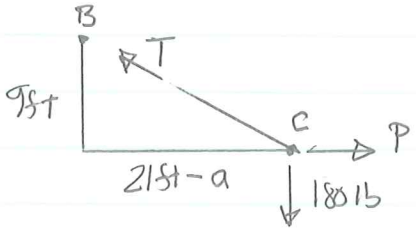


7.103




$\Sigma M_A = P \cdot 12\,ft - 320\,lb \cdot a = 0$

$\Rightarrow P = \frac{80}{3} a \; lb/ft$ (1)

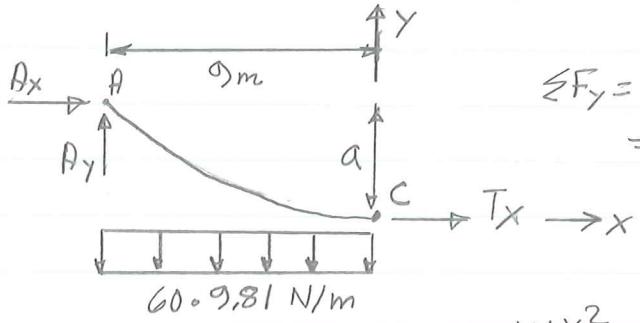



$\Sigma M_B = P \cdot 9\,ft - 180\,lb \cdot (21\,ft - a)$

$\Rightarrow P = 4201b - 20a \; lb/ft$ (2)

From (1) and (2): $\boxed{P = 240\,lb}$, $\boxed{a = 9\,ft}$

7.116




$\Sigma F_y = A_y - 60 \cdot 9.81\,N/m \cdot 9m$

$\Rightarrow \boxed{A_y = 5297\,N}$

With origin at C, $y = \frac{wx^2}{2T_x}$

$y_A = a = 60 \cdot 9.81\,N/m \cdot (9m)^2 / 2 / T_x$ (1)

$y_B = a - 2.25\,m = 60 \cdot 9.81\,N/m \cdot (6m)^2 / 2 / T_x$ (2)

From (1) and (2), $\boxed{a = 4.05\,m}$, $\boxed{T_x = 5886\,N}$

From free-body, $\Sigma F_x = A_x + T_x = 0 \Rightarrow \boxed{A_x = -5886\,N}$

From book section 7.9:

$$S_{AB} \approx x_B\left(1 + \frac{2}{3}\left(\frac{y_B}{x_B}\right)^2 - \frac{2}{5}\left(\frac{y_B}{x_B}\right)^4\right) - x_A\left(1 + \frac{2}{3}\left(\frac{y_A}{x_A}\right)^2 - \frac{2}{5}\left(\frac{y_A}{x_A}\right)^4\right)$$

$x_A = -9m$, $x_B = 6m$, $y_A = 4.05m$, $y_B = 1.8m$

$\boxed{S_{AB} \approx 16.41\,m}$