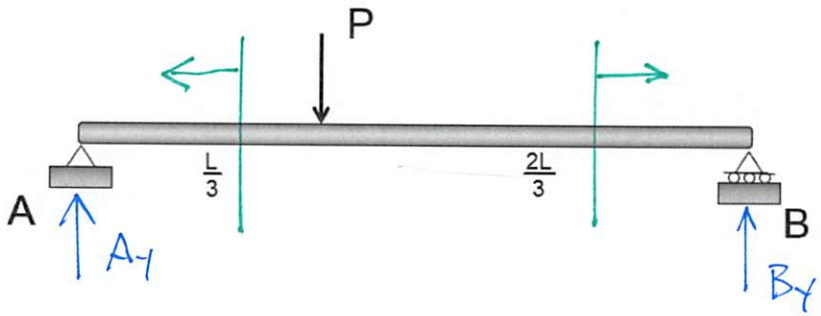
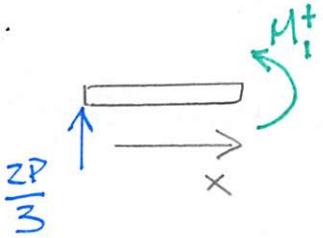
Example 7a-3: Determine the equations for slope and displacement in the following beam.



$$\circlearrowleft +\sum M_B = 0 = P\left(\frac{2L}{3}\right) - A_y(L) \qquad A_y = \frac{2P}{3}$$

$$+\uparrow \sum F_y = 0 = A_y + B_y - P \qquad B_y = \frac{P}{3}$$

$0 \le x \le L/3$



$$\circlearrowleft +\sum M_{cut} = 0$$

$$= M_1 - \frac{2P}{3}x$$

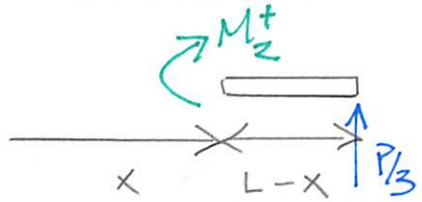
$$M_1(x) = \frac{2Px}{3}$$

$$\theta_1 = \int \frac{M_1}{EI}dx = \frac{2P}{3}\left(\frac{x^2}{2}\right) + C_1$$

$$y_1 = \int \theta\, dx = \frac{2P}{3}\left(\frac{x^3}{6}\right) + C_1 x + C_2$$

$$y_1(x=0) = 0 = C_2$$

$L/3 \le x \le L$



$$\circlearrowleft +\sum M_{cut} = 0$$

$$= -M_2 + \frac{P}{3}(L-x)$$

$$M_2(x) = \frac{P}{3}(L-x)$$

$$\theta_2 = \int \frac{M_2}{EI}dx = \frac{P}{3}\left[xL - \frac{x^2}{2}\right] + C_3$$

$$y_2 = \int \theta_2\, dx = \frac{P}{3}\left[\frac{Lx^2}{2} - \frac{x^3}{6}\right] + C_3 x + C_4$$

$$y_2(x=L) = 0 \Rightarrow C_3 \text{ \& } C_4 \quad (1)$$

$$\theta_1(x=L/3) = \theta_2(x=L/3) \Rightarrow C_1 \text{ \& } C_3 \quad (2)$$

$$y_1(x=L/3) = y_2(x=L/3) \Rightarrow C_1, C_3, \text{ \& } C_4 \quad (3)$$