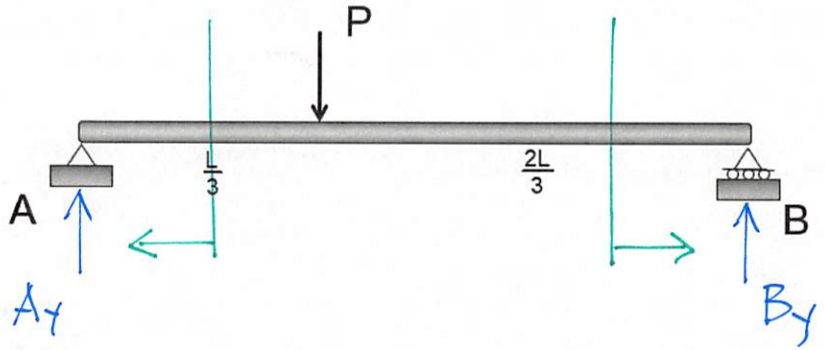
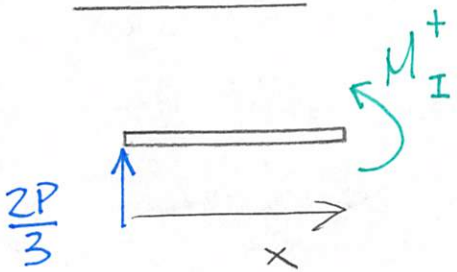
**Example 7a-3:** Determine the equations for slope and displacement in the following beam.




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

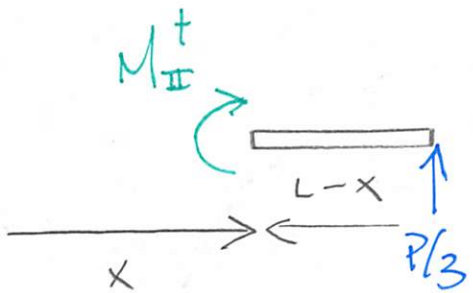
$$+\uparrow \sum F_y = 0 = A_y + B_y - P \qquad B_y = \frac{P}{3}$$

$0 \le x \le L/3$




$$\circlearrowleft + \sum M_{CUT} = 0 = M_I - \frac{2P}{3}x \qquad M_I = \frac{2Px}{3} \qquad M_I(x=0) = 0 \checkmark$$

$L/3 \le x \le L$

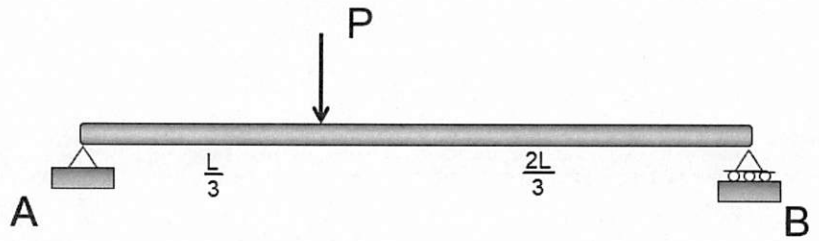



$$\circlearrowleft + \sum M_{CUT} = 0 = -M_{II} + \frac{P}{3}(L-x) \qquad M_{II} = \frac{P}{3}(L-x)$$

$$M_{II}(x=L) = 0 \checkmark$$

$$M_I(x=L/3) = M_{II}(x=L/3) \checkmark$$

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




$y(x=0) = 0$ ①

$y(x=L) = 0$ ②

$\theta_I(x=L/3) = \theta_{II}(x=L/3)$ ③

$y_I(x=L/3) = y_{II}(x=L/3)$

$0 \le x \le L/3$

$$EI\theta_I = \int M_I dx = \frac{Px^2}{3} + C_1$$

$$y_I = \int \theta_I dx = \frac{1}{EI}\left[\frac{Px^3}{9}\right] + C_1 x + C_2$$

$L/3 \le x \le L$

$$EI\theta_{II} = \int M_{II} dx = \frac{P}{3}\left(Lx - \frac{x^2}{2}\right) + C_3$$

$$y_{II} = \int \theta_{II} dx = \frac{P}{3EI}\left[\frac{Lx^2}{2} - \frac{x^3}{6}\right] + C_3 x + C_4$$

① $y(x=0) = 0 = C_2$

② $y(x=L) = 0 \Rightarrow f(C_3 \& C_4)$

③ $f(C_1 \& C_3)$

④ $f(C_1, C_3, \& C_4)$