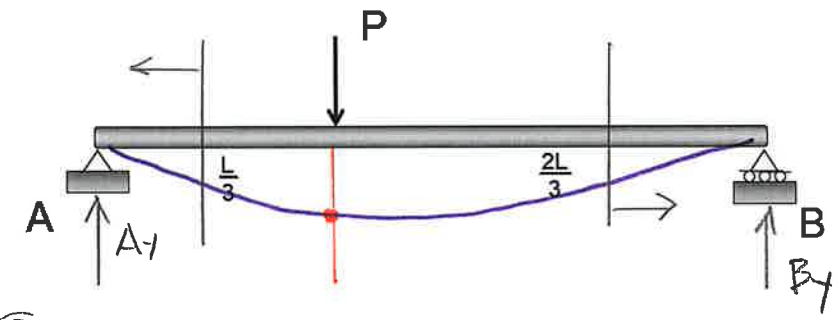
Example 7a-3: Determine the equations for slope and displacement in the following beam.

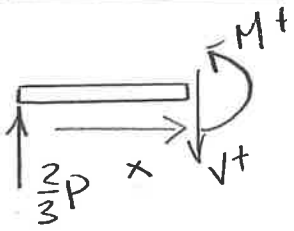


$$\circlearrowleft + \sum M_B = 0 = P\left(\frac{2L}{3}\right) - A_y(L) \qquad A_y = \frac{2}{3}P$$

$$+\uparrow \sum F_y = 0 = A_y + B_y - P \qquad B_y = \frac{1}{3}P$$

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

(I) $0 \le x \le L/3$



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

$$= M - \frac{2}{3}Px$$

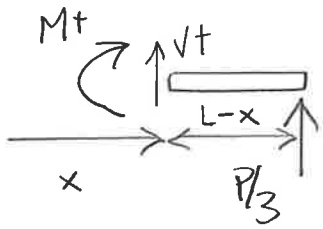
$$M_I = \frac{2Px}{3}$$

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

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

$$y_I(x=0) = 0 \ (1) \qquad C_2 = 0$$

(II) $L/3 \le x \le L$



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

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

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

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

$$y_{II} = \int \theta dx = \frac{1}{EI}\left[\frac{P}{3}\left(\frac{Lx^2}{2} - \frac{x^3}{6}\right) + C_3 x + C_4\right]$$

$$y_{II}(x=L) = 0 \ (2) \Rightarrow C_3 \text{ \& } C_4$$

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

C_1, C_3 & C_4

$$\theta_I(x=L/3) = \theta_{II}(x=L/3) \ (4)$$

C_1 & C_3