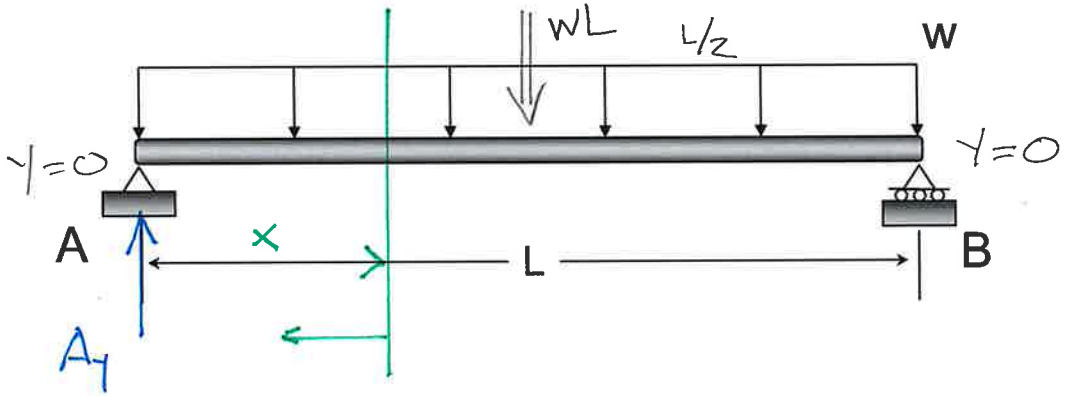
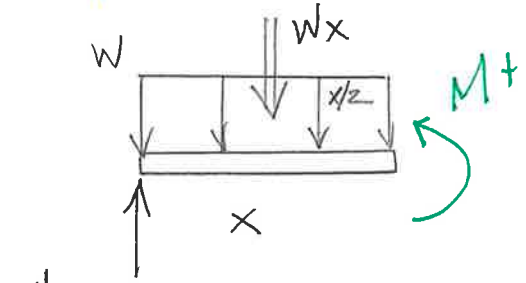
Example 7a-1: Determine the equations for slope and displacement in the following beam.



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

$$A_y = \frac{wL}{2}$$



$$\circlearrowleft + \sum M_{CUT} = 0 = M + wx\left(\frac{x}{2}\right) - \frac{wL}{2}(x)$$

$$M(x) = w\left[-\frac{x^2}{2} + \frac{Lx}{2}\right] \checkmark$$

$$M(x=0) = 0$$

$$M(x=L) = 0$$

$$\theta = \int \frac{M}{EI}dx = \frac{w}{2EI}\int(-x^2+Lx)dx = \frac{w}{2EI}\left[-\frac{x^3}{3} + \frac{Lx^2}{2}\right] + C_1$$

$$y = \int \theta dx = \frac{w}{2EI}\int\left(-\frac{x^3}{3} + \frac{Lx^2}{2}\right)dx + \int C_1 dx = \frac{w}{2EI}\left[-\frac{x^4}{12} + \frac{Lx^3}{6}\right] + C_1 x + C_2$$

$$y(x=0) = 0 = C_2$$

$$y(x=L) = 0 = \frac{w}{2EI}\left[\frac{L^4}{12}\right] + C_1 L$$

$$C_1 = -\frac{wL^3}{24EI}$$

$$\theta = \frac{W}{2EI}\left[-\frac{x^3}{3} + \frac{Lx^2}{2}\right] - \frac{WL^3}{24EI}$$

$$y = \frac{W}{2EI}\left[-\frac{x^4}{12} + \frac{Lx^3}{6}\right] - \frac{WL^3x}{24EI}$$