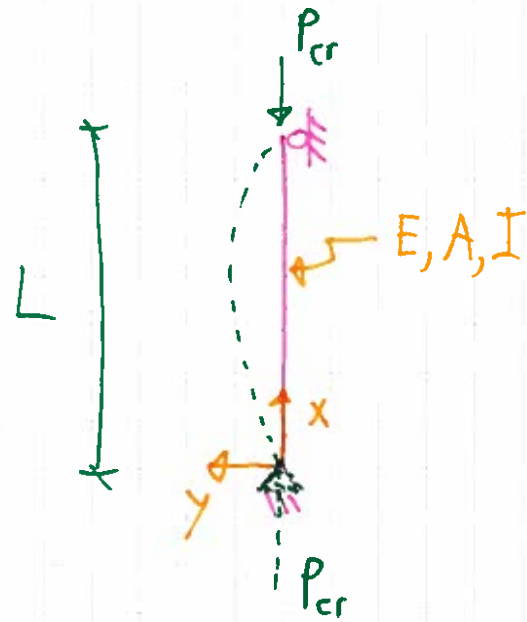
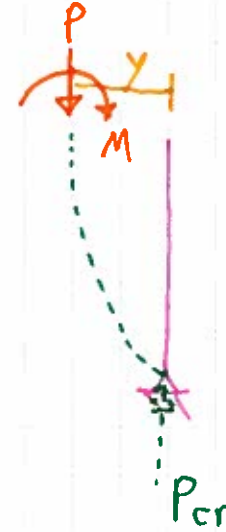




draw FBD @ "x" of the deformed shape



$$\sum M_{cut} = 0 \Rightarrow M = -P_y$$

CVEN 305:

$$M = \frac{d^2 y}{dx^2} EI$$

$$\therefore \frac{d^2 y}{dx^2} EI = -P_y \Rightarrow \frac{d^2 y}{dx^2} EI + P_y = 0$$

$$y'' EI + P_y = 0 \quad (2^{nd} \text{ order ODE})$$

Solve w/

$$y = A \sin(wx) + B \cos(wx)$$

$$w = \sqrt{\frac{P}{EI}}$$

To solve for A & B, use Bound. Cond.

a) $x=0, y=0$

b) $x=L, y=0$

$$y = A \overset{0}{\sin(0)} + B \overset{1}{\cos(0)} = 0$$

$$y = B = 0 \Rightarrow B = 0$$

$$y = A \sin(wL) + \overset{0}{B \cos(wL)} = 0$$

$$y = A \sin(wL) = 0$$

$$A \neq 0$$

$$\therefore \sin(wL) = 0$$

$$\text{for } \sin(n\pi) = 0$$

$$\text{where } n=0, 1, 2, 3 \dots$$

$$\text{sub } w = \sqrt{\frac{P}{EI}} \Rightarrow \sqrt{\frac{P}{EI}} L = n\pi$$

Solve for P:

$$P = \frac{n^2 \pi^2 EI}{L^2}$$

$$P_{\min}, n=1$$

$$P_{\min} = \frac{\pi^2 EI}{L^2}$$

(P_e , 4.3 Segui)