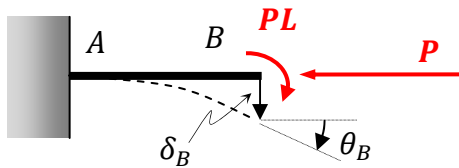
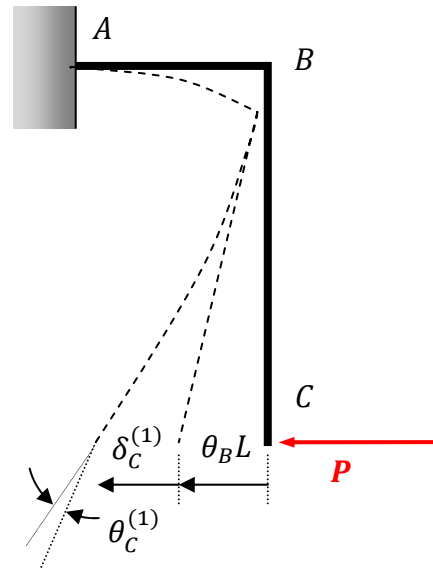


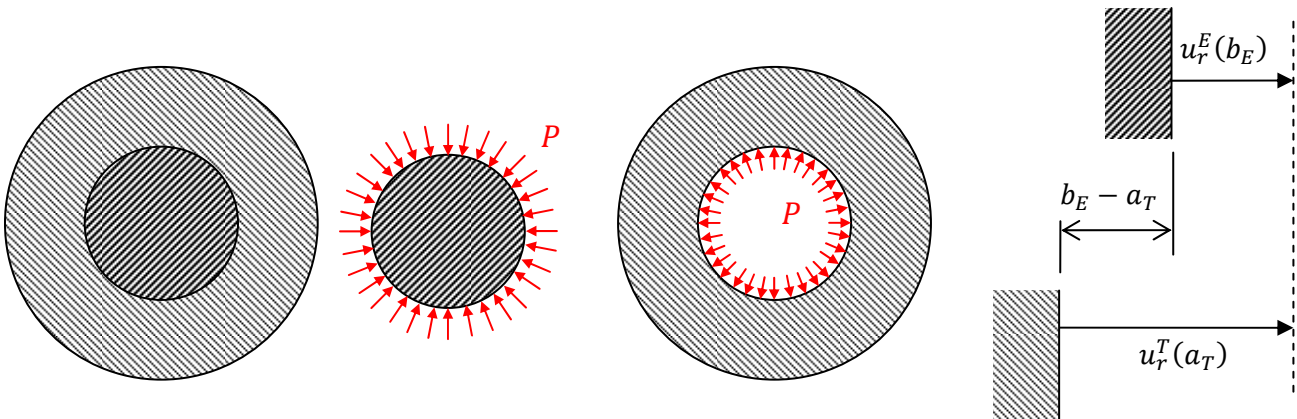
Problema 1 (3,5 pontos).



$$\begin{aligned} \delta_C &= \theta_B L + \delta_C^{(1)} \\ \theta_C &= \theta_B + \theta_C^{(1)} \\ \left. \begin{aligned} \theta_B &= \frac{(PL)(L/2)}{EI} \\ \delta_C^{(1)} &= \frac{PL^3}{3EI} \\ \theta_C^{(1)} &= \frac{PL^2}{2EI} \end{aligned} \right\} \Rightarrow \left\{ \begin{aligned} \delta_C &= \frac{5PL^3}{6EI} \\ \theta_B &= \frac{PL^2}{EI} \end{aligned} \right.$$



Problema 2 (3,5 pontos).



$$u_r^T(a_T) = u_r^E(b_E) + (b_E - a_T)$$

$$u_r^E(b_E) = -\frac{(1-\nu)}{E} b_E P$$

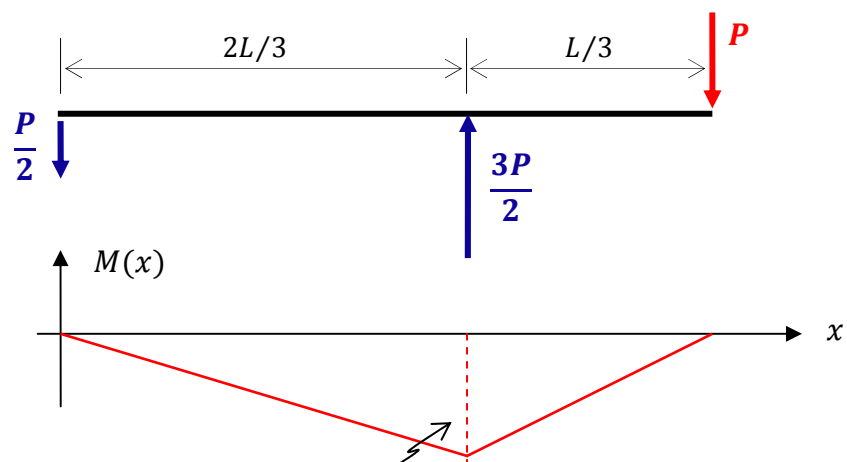
$$u_r^T(a_T) = \frac{(1-\nu)a_T^3 + (1+\nu)a_T b_T^2}{E(b_T^2 - a_T^2)} P$$

Para $E = 200 \text{ MPa}$

$$\sigma_{rr}^T(a_T) = \sigma_{rr}^E(b_E) = -P = -\frac{E(b_T^2 - a_T^2)(b_E - a_T)}{(1-\nu)a_T^3 + (1+\nu)a_T b_T^2 + (1-\nu)(b_T^2 - a_T^2)b_E} = -0,0937 \text{ MPa}$$

Para $E = 200 \text{ GPa}$, $\sigma_{rr}^T(a_T) = \sigma_{rr}^E(b_E) = -93,7 \text{ MPa}$.

Problema 3 (3,0 pontos).



$$\max\{|M(x)|\} = |M(2L/3)| = PL/3$$

$$M_L = P_L L/3 \Rightarrow P_L = 3M_L/L = 3bh^2 S_Y/4L$$