EXERCÍCIO

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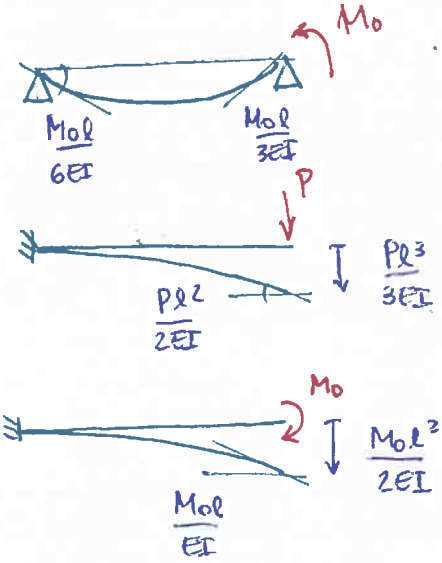
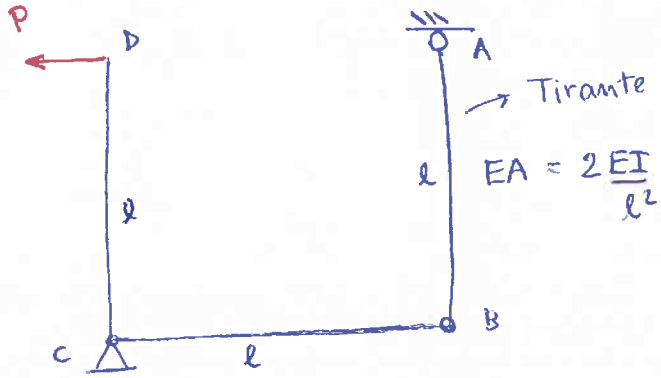
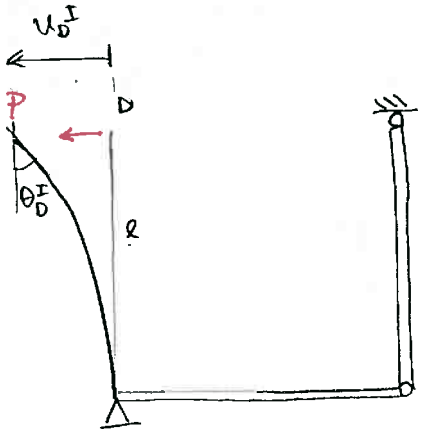
Determinar o deslocamento de D.





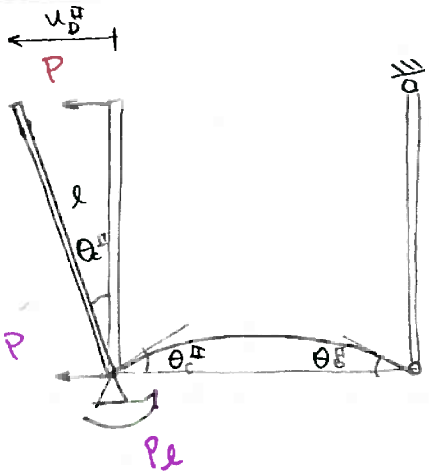
Caso I



$$v_D^I = 0 \qquad u_{D1} = \frac{P\ell^3}{3EI} \ (\leftarrow)$$

$$\theta_B^I = \frac{P\ell^2}{2EI}$$

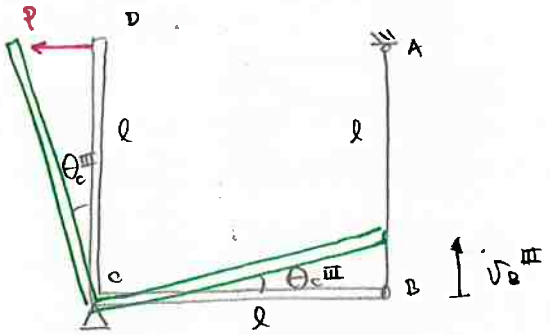
Caso II

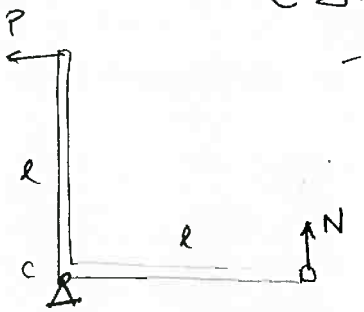


$$\theta_c^{II} = \frac{(P\ell)\ell}{3EI} \Rightarrow \theta_c^{II} = \frac{P\ell^2}{3EI}$$

$$u_D^{II} = \theta_c^{II} \cdot \ell \Rightarrow u_D^{II} = \frac{P\ell^3}{3EI}$$

Caso 3





$\circlearrowleft \sum M_C = 0$

$-P\ell - N.\ell = 0$

$N = -P$ (C)

$$v_B^{III} = \frac{N.\ell}{EA} = \frac{P\ell}{EA}, \text{ mas } EA = \frac{2EI}{\ell^2} \Rightarrow \boxed{v_B^{III} = \frac{P\ell^3}{2EI}}$$

$$u_D^{III} = v_B^{III} \Rightarrow \boxed{u_D^{III} = \frac{P\ell^3}{2EI}} \ (\leftarrow)$$

Assim, $u_D = u_D^{I} + u_D^{II} + u_D^{III}$

$$u_D = \frac{P\ell^3}{EI}\left(\frac{1}{3} + \frac{1}{3} + \frac{1}{2}\right) \Rightarrow \boxed{u_D = \frac{7}{6}.\frac{P\ell^3}{EI}}$$