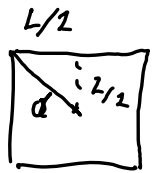
Exercício 1

$$I_{cm} = m\frac{L^2}{6}$$

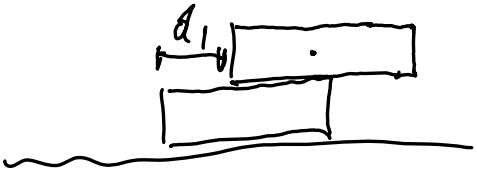


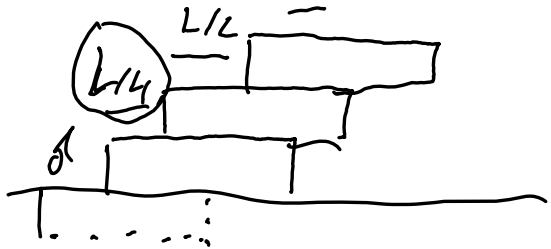
$$I = I_{cm} + m d^2$$

$$d = \sqrt{\left(\frac{L}{2}\right)^2 + \left(\frac{L}{2}\right)^2} = \sqrt{\frac{L^2}{4} + \frac{L^2}{4}} = \sqrt{\frac{\cancel{2}}{\cancel{4}\,2}L^2} = \frac{L}{\sqrt{2}}$$

$$I = m\frac{L^2}{6} + m\left(\frac{L}{\sqrt{2}}\right)^2 = m\frac{L^2}{6} + m\frac{L^2}{2} = \frac{\cancel{4}^{\,2}}{\cancel{6}\,3}mL^2$$

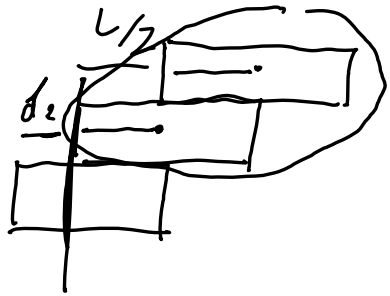
Esercizio 2





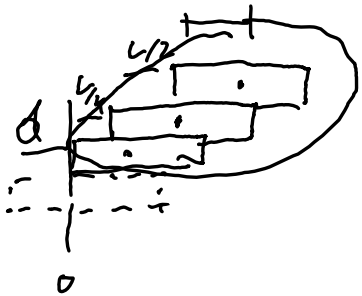
$$x_{cm} = \frac{L}{2}$$

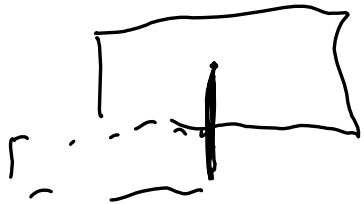
$$d_1 = \left(L - \frac{L}{2}\right) = \frac{L}{2}$$

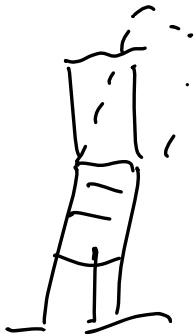


$$x_{cm} = \frac{m\frac{L}{2} + mL}{2m} = \frac{\frac{3}{2}\cancel{m}L}{2\cancel{m}} = \frac{3}{4}L$$

$$d_2 = \left(L - \frac{3}{4}L\right) = \frac{1}{4}L$$







$$X_{em} = \frac{\cancel{m}\frac{L}{2} + \cancel{m}\left(\frac{L}{4} + \frac{L}{2}\right) + \cancel{m}\left(\frac{L}{4} + \frac{L}{2} + \frac{L}{2}\right)}{3\cancel{m}} =$$

$$= \frac{\frac{L}{2} + \frac{3}{4}L + \left(\frac{L + 2L + 2L}{4}\right)}{3} = \left(\frac{L}{2} + \frac{3}{4}L + \frac{5}{4}L\right)\frac{1}{3}$$

$$x_{cm} = \left(\frac{L}{2} + \frac{3}{4}L + \frac{5}{4}L\right)\frac{1}{3} = \left(\frac{2+3+5}{4}\right)\frac{L}{3} = \frac{\cancel{10}^{5}}{\cancel{12}_{6}}L$$

$$\boxed{d = L - \frac{5}{6}L = \frac{1}{6}L}$$

$$d_1 = \frac{1}{2}$$

$$d_2 = \frac{1}{4}$$

$$d_3 = \frac{1}{6}$$

$$d_n = \frac{1}{2} \cdot \frac{1}{n}$$

Exercício 3

3)

$P_i = m_A v_A$

$P_f = (m_A + m) v_f$

$\Rightarrow m_A v_A = (m_A + m) v_f$

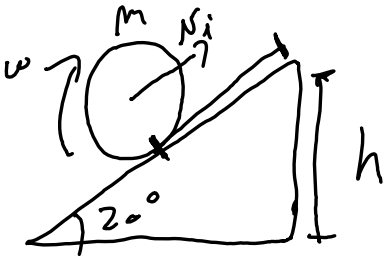
$$v_f = \frac{m_A}{m_A + m} v_A$$

6 m/s

B = 2,5 m/s

$v_f = v_A$

$v_f \to 0$



$v_i = 1{,}5\ m/s$

$I = \frac{2}{5} m R^2$

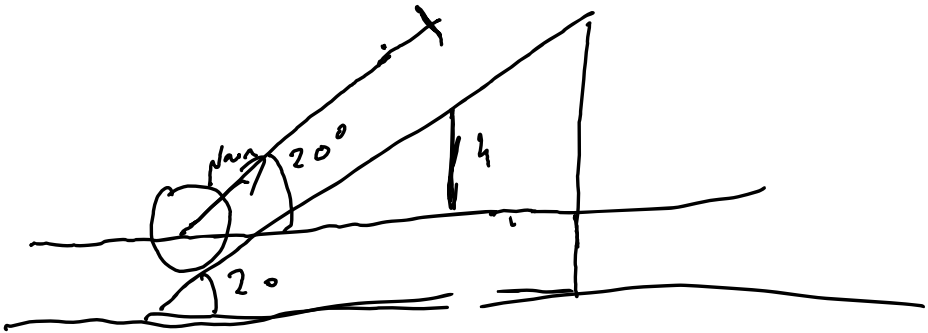
Exercício 4

$$K_i = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} I \omega^2 = \frac{1}{2} m v_{cm}^2 + \frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{5} m R^2 \left(\frac{v_{cm}}{R}\right)^2$$

$$\omega = \frac{v_{cm}}{R}$$

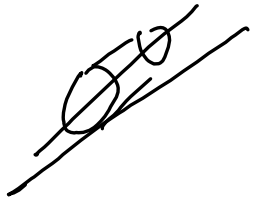
$$K_i = \frac{1}{2} m v_{cm}^2 + \frac{1}{5} m \cancel{R^2} \frac{v_{cm}^2}{\cancel{R^2}} = \frac{5 m v_{cm}^2 + 2 m v_{cm}^2}{10} = \frac{7}{10} m v_{cm}^2$$

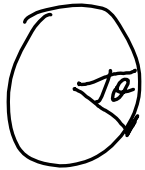
A → 1,1 J ; B = 1,6 J



$$K_i = \underset{\overset{\shortparallel}{0}}{K_f} + mgh \Rightarrow h = \frac{K_i}{mg} = \frac{7}{10}\frac{\cancel{m}v^2}{\cancel{m}g} \simeq 16\ \text{cm}$$

$$d\sin(20) = h \Rightarrow d = \frac{h}{\sin 20} \simeq 47\ \text{cm}$$





$$I = \int R^2 \cdot dm$$

$$m = \sigma \cdot A$$

$$A = 2\pi R \cdot L$$

$$dA = R\, d\theta\, dL$$

$$I = \int_0^L \int_0^{2\pi} R^2 \cdot R\sigma\, d\theta\, dL =$$

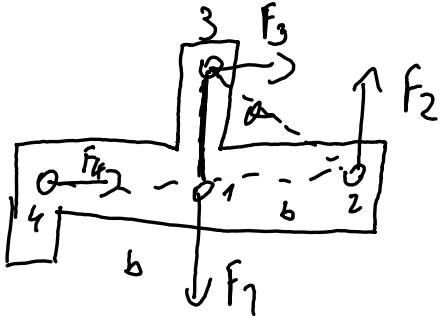
$$= R^2 \underbrace{R\,\sigma \cdot 2\pi L}_{m} = mR^2$$

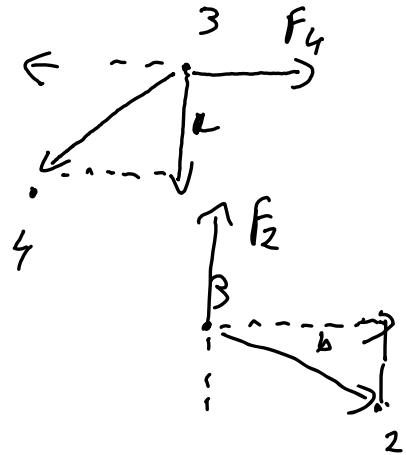
$$K_i = \frac{1}{2} m v_{cm}^2 + \frac{1}{2} m \cancel{R^2} \frac{v_{cm}^2}{\cancel{R^2}} = m v_{cm}^2$$

1,6 J A

2,3 J B

Esercizio 5



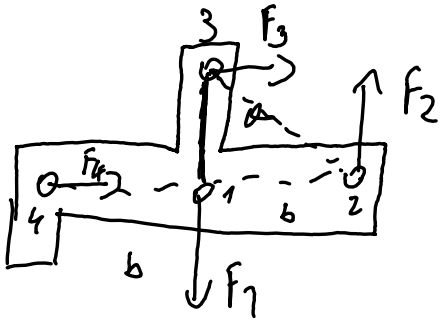


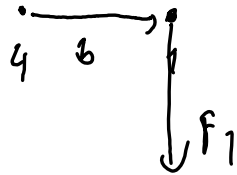
1) $b F_2 - a F_3$ O No

2) $b F_1 - a F_3$ O No

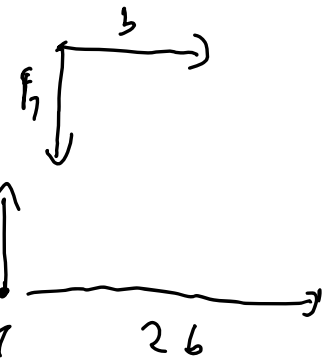
3) $a F_4 + b F_2$; $\underbrace{\boxed{a F_2 - a F_4}}_{A}$ $\cancel{O}$

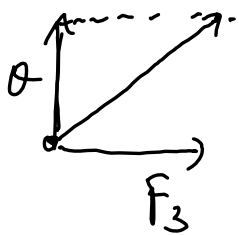
$\underbrace{\boxed{b F_2 - a F_4}}_{B}$ $\cancel{O}$





$$-bF_1 + 2bF_2 - aF_3 \quad 0$$



A) $-bF_1 + 2bF_2 - aF_3$ 0

B) $-bF_1 + bF_2 - aF_3$ ~~0~~