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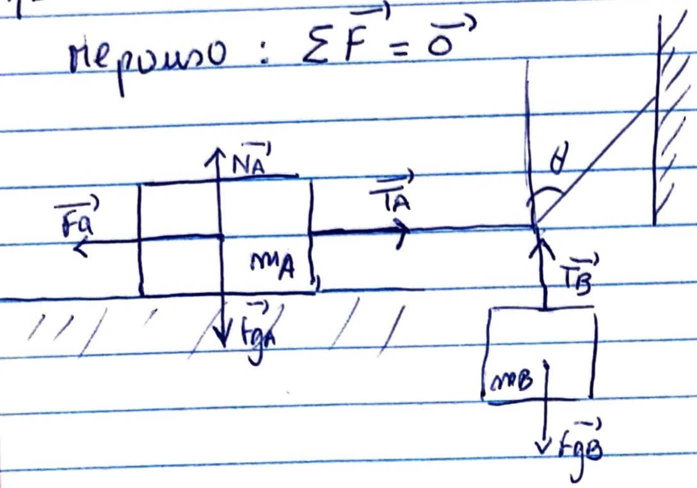
1-

repouso : $\sum \vec{F} = \vec{0}$



$$m_a : \begin{cases} xx' : \vec{Fa} + \vec{Ta} = 0 \\ yy' : \vec{Na} + \vec{Fga} = 0 \end{cases} \Leftrightarrow \begin{cases} Ta = Fa = \mu \times Na = \mu \times m_A g \\ Na = Fga \end{cases}$$

$$m_B : \begin{cases} xx' : \text{———} \\ yy' : \vec{Fg_B} + \vec{T_B} = 0 \end{cases} \Leftrightarrow \begin{cases} \text{———} \\ yy' : Fg_B = T_B \end{cases} \Leftrightarrow \begin{cases} \text{———} \\ T_B = m_B g \end{cases}$$

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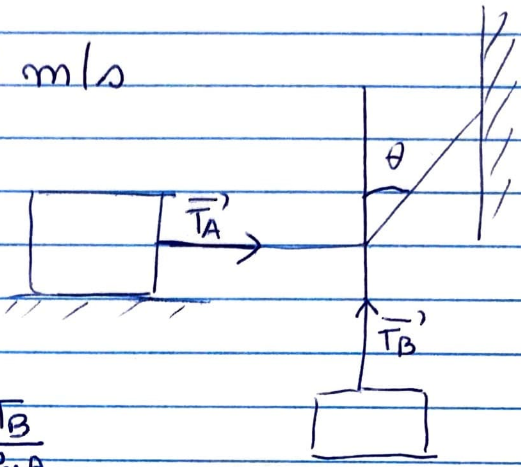
2- $\mu = 0{,}3$

$\theta = 37^\circ$

$m_a = 1{,}0\ kg$

repouso: $\sum \vec{F} = 0$

$g = 9{,}8\ m/s$



$T_A = \mu m_A g$

$T_B = m_B g$

$T = \frac{T_A}{\cos\theta} \wedge T = \frac{T_B}{\sin\theta}$

$T_A = 0{,}3 \times 1{,}0 \times 9{,}8 = 2{,}94$

$T_B = m_B g$

$T = \frac{T_A}{\cos 37^\circ} = \frac{2{,}94}{\cos 37^\circ} \simeq 3{,}68$

$T_B = T \times \sin\theta = 3{,}68 \times \sin 37$

$T_B = m_B g \Leftrightarrow 9{,}8 \times m_B = 3{,}68 \times \sin 37$

$\Leftrightarrow m_B \simeq 0{,}2\ kg$

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3 -

$$\vec{F} = (2y^2 - x^2)\,\hat{\imath} + 2xy\,\hat{\jmath} \ (N)$$

$y = x^2$

$$W = \int_0^2 \underset{y=x^2}{(2y^2 - x^2)}\,dx + \int_0^4 \underset{x=\sqrt{y}}{2xy}\,dy$$

$$= \int_0^2 (2(x^2)^2 - x^2)\,dx + \int_0^4 2\sqrt{y}\cdot y\,dy$$

$$= \int_0^2 (2x^4 - x^2)\,dx + \int_0^4 2y^{3/2}\,dy$$

$$= \left[\frac{2x^5}{5} - \frac{x^3}{3}\right]_0^2 + \left[\frac{2\,2}{5}y^{\frac{5}{2}}\right]_0^4 \simeq 35{,}8\ J$$

$$\simeq \frac{536}{15}\ J$$

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4- A força não é conservativa, porque o trabalho depende da trajetória.

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5.

$M = 1\,kg$

$\vec{F} = (2x\hat{i} + 2z\hat{k})$ (N)

$\vec{F} = -\vec{\nabla} E_p \Leftrightarrow (2x\hat{i} + 2z\hat{k}) = -\vec{\nabla} E_p$

$\Leftrightarrow (2x\hat{i} + 2z\hat{k}) = -\Big[\frac{d}{dx} E_p(x,y,z)\,\hat{i} + \overbrace{\frac{d}{dy} E_p(x,y,z)\,\hat{j}}^{=0}$

$+ \frac{d}{dz} E_p(x,y,z)\,\hat{k} \Big]$

$\Leftrightarrow E_p(x,y,z) = -\left(\int 2x\hat{i}\,dx + \int 2z\hat{k}\,dz \right)$

$= -(x^2 + z^2)$ (J)