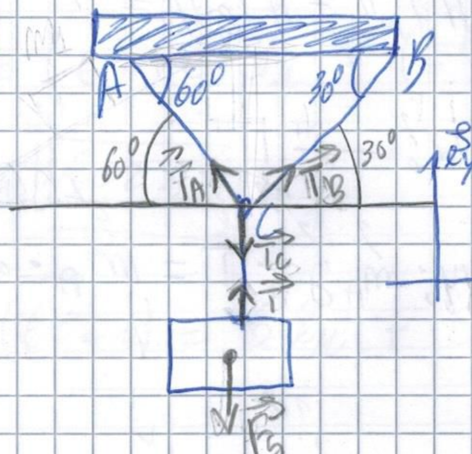
PN 11/10/18

2

2.1)

a)



massa de 1kg

equilíbrio $\Rightarrow \sum \vec{F} = \vec{0}$

Fios inextensíveis

$\hookrightarrow |\vec{T}| = |\vec{T_C}| = T_C$

b) $\begin{cases} xx: \vec{T_{Bx}} + \vec{T_{Ax}} = \vec{0} \\ yy: \vec{T_{By}} + \vec{T_{Ay}} + \vec{T_C} = \vec{0} \end{cases} \Rightarrow$ (É igual ao vetor nulo pois está em equilíbrio) 2º Lei de Newton

$\Rightarrow \begin{cases} xx: T_B \cos 30 - T_A \cos 60 = 0 \\ yy: T_B \operatorname{sen} 30 + T_A \operatorname{sen} 60 - \underset{9,8}{T_C} = 0 \end{cases}$ ...

xx:

yy:

No corpo

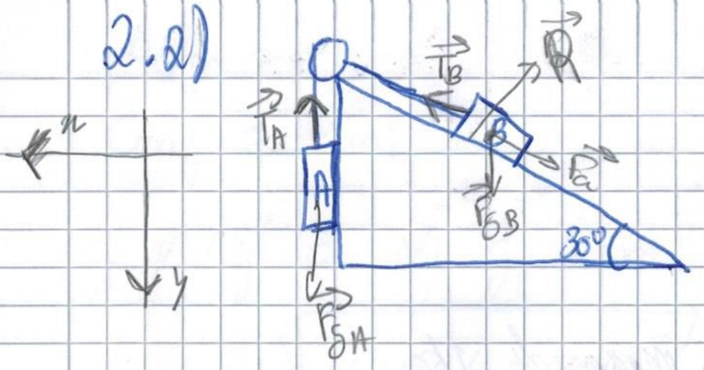
$\hookrightarrow \begin{cases} xx: — \\ yy: \vec{T} + \vec{F_g} = \vec{0} \end{cases} \Rightarrow \begin{cases} xy: — \\ yy: T - F_g = 0 \Rightarrow T = mg = 9,8\, \hat{e}_y\,(N) \end{cases}$

c) $\vec{T_A} = -T_A \cos 60\, \hat{x} + T_A \operatorname{sen} 60\, \hat{y}\ (N)$

$\vec{T_B} = T_B \cos 30\, \hat{x} + T_B \operatorname{sen} 30\, \hat{y}\ (N)$

$\vec{T_C} = -T_C\, \hat{e}_y = -9,8\, \hat{e}_y\ (N)$

2.2)



fio inextensível

roldana fixa

$m_A = 2\,kg$ / $m_B = 1\,kg$

$\|\vec{T_A}\| = \|\vec{T_B}\| = T$

a)
b)
c)

Em A

$$\begin{cases} xx: \\ yy: \vec{F_{g_A}} + \vec{T_A} = m_A \cdot \vec{a_A} \end{cases} \Rightarrow \begin{cases} xx: \text{—} \\ yy: m_A g - T = m_A \cdot a \end{cases}$$

Em B

$$\begin{cases} xx: \vec{T_B} + \vec{F_a} + \vec{F_{gx}} = m_B \cdot \vec{a_B} \\ yy: \vec{R} + \vec{F_{gy}} = \vec{0} \end{cases} \Rightarrow \begin{cases} xx: T - \mu_c R - mg \sin 30 = mg \cdot a \\ yy: -R + m_B g \cos 30 = 0 \end{cases}$$

2.3) $m = 1\,kg$

a) $\vec{v_0} = +1\,\hat{e}_x + 2\hat{e}_y$ (m/s)

$\vec{F}(t) = 2\hat{e}_x - \frac{1}{2}\hat{e}_y$ (N)

$\Rightarrow \vec{F} = m \cdot \vec{a} \wedge m = 1\,kg \Rightarrow \vec{a} = 2\hat{e}_x - \frac{1}{2}\hat{e}_y$ (m/s)

$$v(t) = \int \left(2\hat{e}_x - \frac{1}{2}\hat{e}_y\right) dt = 2t\hat{e}_x - \frac{1}{2}t\,\hat{e}_y + c^{te}$$

c^{te}: $v(t=0\,s) = 1\hat{e}_x + 2\hat{e}_y \Rightarrow c^{te} = 1\hat{e}_x + 2\hat{e}_y$

$$\vec{v}(t) = 2t\,\hat{e}_x - \frac{1}{2}t\,\hat{e}_y + 1\hat{e}_x + 2\hat{e}_y$$
$$= (2t+1)\,\hat{e}_x + \left(-\frac{1}{2}t + 2\right)\hat{e}_y$$
$$= (2t+1)\,\hat{e}_x + \left(-\frac{t}{2} + 2\right)\hat{e}_y \text{ (m/s)} \;//$$

b) $r(t) = \int v(t)\, dt = \int (2t+1)\hat{e}_x + \left(-\frac{t}{2}+2\right)\hat{e}_y \, dt =$

$= \left(\frac{2t^2}{2} + t\right)\hat{e}_x + \left(-\frac{t^2}{4} + 2t\right)\hat{e}_y + c^{te}$

$= \left(t^2 + t\right)\hat{e}_x + \left(-\frac{t^2}{4} + 2t\right)\hat{e}_y + \underline{c^{te}}$

c^{te} é ze[ro]
pois assumim[os]
que partícula
origem logo
$t=0 \Rightarrow 0$ //
(logo $c^{te} = 0$)

Para $\boxed{t = 2s}$

$\vec{r}(t=2s) = 6\hat{e}_x + 3\hat{e}_y$ (m)

c) $W = \int_A^B \vec{F(x)}\, d\vec{x}$

$W = \Delta E_c$

$W = \frac{1}{2} m v^2(t=2s) - \frac{1}{2} m v_0^2$

$\vec{v}(t=2s) = (2 \times 2 + 1)\hat{e}_x + \left(-\frac{1}{2} \times 2 + 2\right)\hat{e}_y$

$= 5\hat{e}_x + 1\hat{e}_y$ (m/s)

$\|\vec{v}(t=2s)\| = \sqrt{5^2 + 1^2} = \sqrt{26}$

$W = \Delta E_c = \frac{1}{2} \times 1 \times (26 - 5) = 10{,}5$ J //

2.4) $m = 5{,}0\ kg$

$\vec{F} = (-2y+4)\,\vec{e}_x + (-2x-2)\,\vec{e}_y\ (N)$

$\vec{F}$ é conservativa

$W = \int \vec{F}(x,y,z) \cdot d\vec{x}\,d\vec{y}\,d\vec{z} = \int F_x dx + \int F_y dy + \int F_z dz$

$W = \int_1^5 (-2y+4)\,dx + \int_{1/2}^{5/2} (-2x-2)\,dy = \int_1^5 \left(-2\frac{x}{2}+4\right)dx + \int_{1/2}^{5/2} (-2(2y)-2)\,dy$

$y = x/2 \qquad x = 2y$

$= -12\ (J)$

b) $W(F_{res}) = \Delta E_C$

$W(F_{cons}) = -\Delta E_p$

$\Delta E_p = +12\ J$

$F_{resultante} = F_{conservativa}$

c) $W\ \Delta E_c = -12 = \frac{1}{2} m (v_f^2 - v_i^2)$

$-24 = 5(v_f^2 - 16)$

$v_f = 3{,}3\ m/s$