b) $T = m_B \cdot a$

$T = -m_A \cdot a + P_A \text{ sen } \theta$

$\Rightarrow T = 2 \times 2{,}5 = 5 \ (N)$

$\boxed{\text{PN } 28/9/12}$

1.- $v(t) = a + bt^4 \ (m/s)$

$a = 6 \ , \ b = 2$

$x(0) = 0$

a) $a(t)$?

$$a_{\text{instantanea}} = \frac{dv}{dt}$$

$$a(t) = \frac{d}{dt}\left[6 + 2t^4\right]$$

$$a(t) = 8t^3 \ (m/s^2)$$

b) $a(0) = 8 \times 0^3 = 0 \ (m/s^2)$

$a(t) = 8 \ (m/s^2)$

c) $x(t) = \int v(t) \, dt$

$$x(t) = 6t + \frac{2t^5}{5} + \cancel{x(0)}^{\,0}$$

d) deslocamento $\rightarrow r(4) - r(2)$

distância percorrida $\rightarrow d = \int_{t=t_0}^{t=t_1} v \, dt$

$[2,4]$ s

deslocamento

$r(4) = 6 \times 4 \times \frac{2}{5} 4^5$

$r(2) = 6 \times 2 \times \frac{2}{5} 2^5$

---

distância percorrida:

$\rightarrow [2,4]$ s se $v = 0$?

$v = 6 + 2t^4 \neq 0$
$[2,4]$ s

$\text{distância} = \int_2^4 (6 + 2t^4) \, dt$

1.2 $\vec{v} = (t^2 - 1)\hat{i} + (-t)\hat{j}$ (m/s)

$\vec{r}(0) = \vec{0}$

a) $\vec{r}$, $(t = 2s) \rightarrow \vec{r}(2)$

$\vec{r}(t) = \int \vec{v}(t) \, dt = \int \left[(t^2 - 1) i - t j \right] d$

$\Leftrightarrow \vec{r}(t) = \left(\frac{t^3}{3} - t \right) i - \frac{t^2}{2} j$ (m)

$\vec{r}(2) = \frac{2}{3} i - 2 j$ (m)

b) $\vec{a}(t) = \frac{d\vec{v}}{dt}$ (derivada de v)

$\vec{a}(t) = 2t\,\hat{i} - 1\,\hat{j}$ (m/s^2)

c) $\vec{a}(t) = \vec{a}_t(t) + \vec{a}_n(t)$

$\vec{a}_t = \frac{d\vec{v}}{dt}$

$\left.\frac{d\vec{v}}{dt}\right|_{t=1} = 2\hat{i} - 1\hat{j}$

$\vec{a}_t = a_t \cdot \hat{\mu}_t$

módulo aceleração ($\vec{a}$)

$a = \sqrt{2^2 + (-1)^2}$

$\vec{a}_t = \sqrt{5}\,\hat{\mu}_t$ (m/s^2)

$v(t) = \sqrt{\underbrace{(t^2-1)^2}_{x^2} + \underbrace{(-t)^2}_{y^2}}$

$a_t(t) = \frac{dv}{dt} = \frac{d}{dt}\left[\sqrt{(t^2-1)^2 + t^2}\right]$

$a_t(t=1)$

$a(t) = \frac{d}{dt}\left(\sqrt{t^4 - 2t^2 + 1 + t^2}\right)$

$a(t) = \frac{d}{dt}\left(t^4 - t^2 + 1\right)^{1/2}$ $a(t=1) \rightarrow a_t$ //

d) $\vec{a}_n = \frac{v^2}{R} \hat{\mu}_n$

$\vec{a} = \vec{a}_t + \vec{a}_n$

$\vec{a}_n = \vec{a} - \vec{a}_t$

$a(t=1) = \frac{d}{dt}\left[(t^4 - t^2 - 1)^{1/2}\right]\Big|_{t=1}$

$a(t=1) = |2t\,i - 1j|_{t=1}$

$a_n|_{t=1} = a|_{t=1} - a_t|_{t=1}$

NOTA

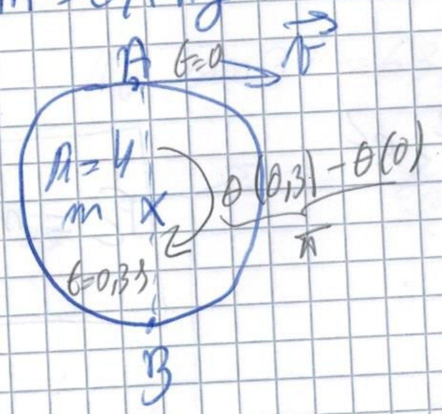
$a = \sqrt{a_x^2 + a_y^2}$

$\vec{a} = a\hat{i} + a\hat{j}$

$\vec{a} = a_t \hat{\mu}_t + a$

13

$m = 0{,}1\,Kg$



movimento uniformemente acelerad

para $t = 0\,s$, posição A

$v = 25\,m/s$

para $t = 0{,}3\,s$, posição B

a) $w(t=0)$

$v = wR$

$w = \frac{v}{R}$

$w_0 = \frac{v_0}{R} = \frac{25}{4}$

$w_0 = 6{,}25\ rad/s$

b) $\theta(t)$?

$$\theta(t) = \theta_0 + w_0 t + \frac{1}{2}\alpha t^2$$

$\theta_0 = 0$ (rad)

$w_0 = 6,25$ rad/s

α?

para $t = 0s \Rightarrow \theta = 0$ rad

para $t = 0,3$ s $\Rightarrow \theta = \pi$ rad

$$\Rightarrow \theta_B = \theta_A + w_0 t_B + \frac{1}{2}\alpha t_B^2$$

$$\pi = 0 + 6,25 \times 0,3 + \frac{1}{2}\alpha \cdot 0,3^2$$

$$\alpha = 28,1 \text{ rad/s}^2$$

c) $$F_c = m\frac{v^2}{R} = \frac{m \cdot w^2 \cdot R^2}{R}$$

$$\boxed{F_c = m a_n}$$

$$\boxed{F_c = m w^2 R}$$

$$F_c^B = m\, w_B^2 \cdot R$$

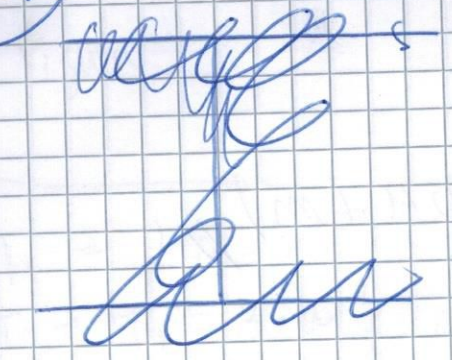
$$w(t) = w_0 + \alpha t$$

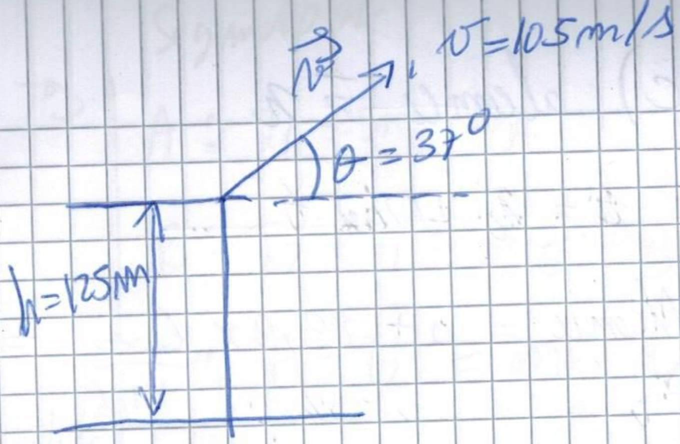
$$w_B = 6,25 + 28,1 \times 0,3$$

$$F_c^B = 0,1 \times (14,7)^2 \times 4$$

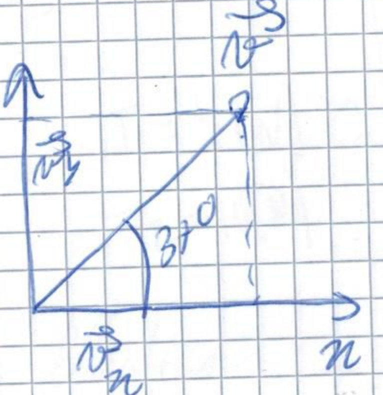
$$F_c^B = 86,2 \text{ (N)}$$

1.4





a)



$v_{0x} = v_0 \cos 37 = 83,9$

$v_{0y} = v_0 \sin 37 = 63,2$ (m/s)

b) t_{voo}

x: $x = x_0 + v_{0x} t$

$v_x = v_{0x}$

y: $y = y_0 + v_{0y} t - \frac{1}{2} g t^2$

$v_y = v_{0y} - g t$

$t_{voo} \rightarrow y = 0$

$y = y_0 + v_{0y} t - \frac{1}{2} g t^2$

$0 = 125 + 63,2\, t_{voo} - \frac{1}{2} g t_{voo}^2$ Fórmula Resolvente

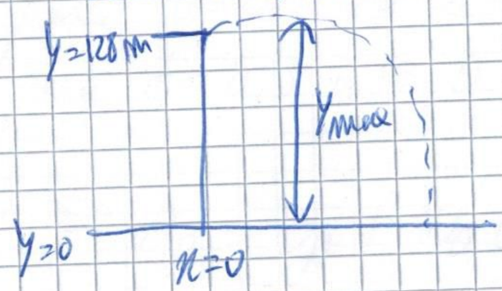
$t_{voo} = 14,6\ s$

c) alcance $\equiv x$

$x = x_0 + v_{0x} t$

$\text{Alcance} = 0 + 89,9 \times \frac{t_{voo}}{14,6} = 1224\ (m)$ //

d) altura máxima



Altura máxima → $v_y = 0$

$v_y = v_{0y} - gt$

$0 = 63,2 - 9,8t$

$t' = 6,4\ (s)$

$y_{max} = y_0 + v_{0y} t' - \frac{1}{2} g t'^2$

$y_{max} = 125 + 63,2 \times 6,4 - \frac{1}{2} 9,8 \times (6,4)^2$

$y_{max} = 328,8\ (m)$ //

TP 1/10/18

$\sum \vec{F} = m\vec{a}$

Solução

$m_A = 2kg$

$m_B = 3kg$

aceleração a?

Tensão nos fios?

movimento $\rightarrow$

Figura

x

$T_1 = 2 \cdot a$

$T_2 - T_1 = 3 \cdot a$

$20 - T_2 = 5 \cdot a$

$a = 2 m/s^2$

$T_1 = 4 (N)$

$T_2 = 10 (N)$

Segunda lei

$A: T_1 = m_A \cdot a_A$

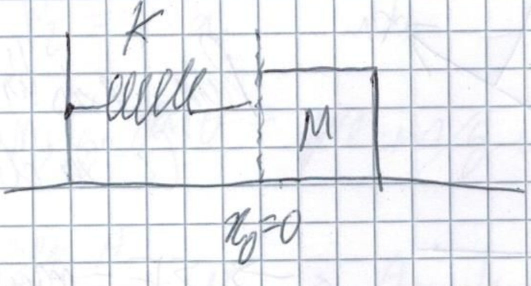
$B: T_2 - T_1 = m_B \cdot a_B$

$C: F - T_2 = m_C \cdot a_C$

$a_A = a_B = a_C = a$

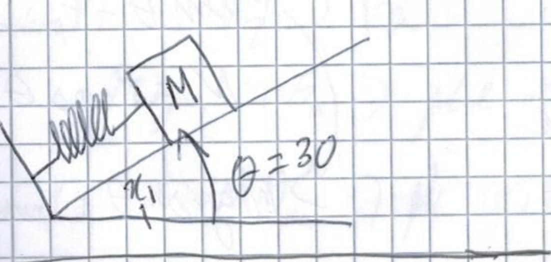
$T_1 \neq T_2$

Força elástica



$K = 125 \ N/m$

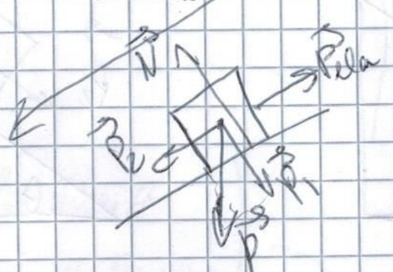
$M = 5,1 \ kg$



$5,1 \times 9,8 \times sen 30^0 = 125 x$

$x = 0,2 (m)$

$F_{elástica} = -Kx$



No equilíbrio: $\Sigma \vec{F} = \vec{0}$

Na direção do movimento ($\vec{F}_{ela} - \vec{P}_2$

$\Rightarrow P_2 = F_{ela} \Rightarrow P sen\theta = Kx$

$(F_{ela} - P_2 = 0)$

$5.1 \times 9,8 \times sen 30^0 = K \cdot x$