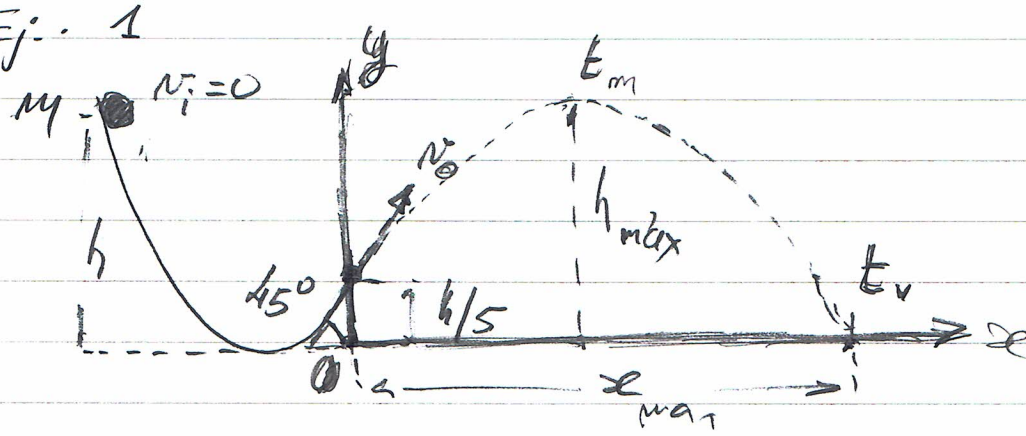
Física I - 1º PARCIAL - 23/10/2020

SOLUCIONES

Ej.: 1



a) $mgh = mg\frac{h}{5} + \frac{m v_0^2}{2} \Rightarrow v_0 = \sqrt{\frac{8}{5}gh}$

$v_y(t) = v_{0y} - gt = v_0 \operatorname{sen} 45° - gt = \frac{v_0}{\sqrt{2}} - gt$

$v_y(t_m) = 0 \Rightarrow t_m = \frac{v_0}{g\sqrt{2}}$ $\quad y(t) = y_0 + v_{0y}t - \frac{gt^2}{2}$

$h_{máx} = y(t_m) = \frac{h}{5} + \frac{v_0}{\sqrt{2}} t_m - \frac{g t_m^2}{2} \Rightarrow h_{max} = \frac{h}{5} + \frac{v_0^2}{4g}$

$v_0 = \sqrt{\frac{8}{5}gh} \Rightarrow \boxed{h_{máx} = \frac{3}{5}h}$

b) $x(t) = v_{0x} t = v_0 \cos 45° t = \frac{v_0}{\sqrt{2}} t \Rightarrow x_{máx} = \frac{v_0}{\sqrt{2}} t_v$

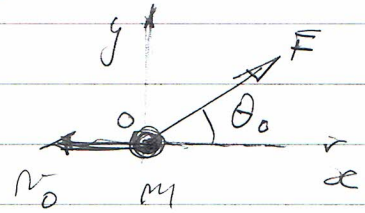
$v_0 = \sqrt{\frac{8}{5}gh} \Rightarrow x_{máx} = 2\sqrt{\frac{gh}{5}}\, t_v$

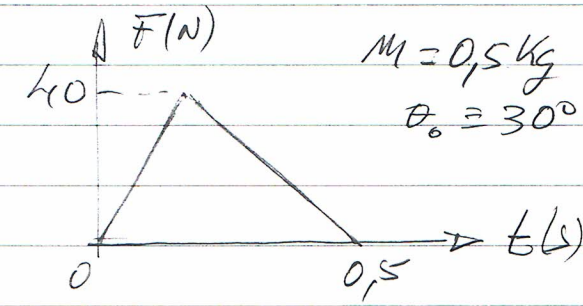
$y(t) = y_0 + v_{0y} t - \frac{gt^2}{2} \Rightarrow y(t_v) = \frac{h}{5} + \frac{v_0}{\sqrt{2}} t_v - \frac{g t_v^2}{2} = 0$

$\Rightarrow t_v = \frac{\sqrt{2}\, v_0 + \sqrt{2v_0^2 + 8gh/5}}{2g} = (2+\sqrt{6})\sqrt{\frac{h}{5g}}$

$\boxed{x_{max} = \frac{2(2+\sqrt{6})}{5}h}$

Ej: 2





$m = 0{,}5\ kg \quad v_0 = 10\ \frac{m}{s}$

$\theta_0 = 30°$

a)

$$I = \int_0 F\,dt = \text{área} = \frac{40 \times 0{,}5}{2} = 10\ N\,s$$

$$\vec{I} = \vec{p}_f - \vec{p}_i = m\vec{v}_f - m\vec{v}_i \Rightarrow \begin{cases} I_x = m v_{fx} - m v_{ix} \\ I_y = m v_{fy} - m v_{iy} \end{cases}$$

$I_x = I \cos\theta_0 = 10 \cos 30° \cong 8{,}7\ N\,s$

$I_y = I \operatorname{sen}\theta_0 = 10 \times \operatorname{sen} 30° = 5\ N\,s$

$m v_{fx} = I_x + m v_{ix} = I_x + (-m v_0) = 8{,}7 - 0{,}5 \times 10$

$\Rightarrow \boxed{v_{fx} = 7{,}4\ \frac{m}{s}}$ $\quad m v_{fy} = I_y + m v_{iy} = I_y \Rightarrow$

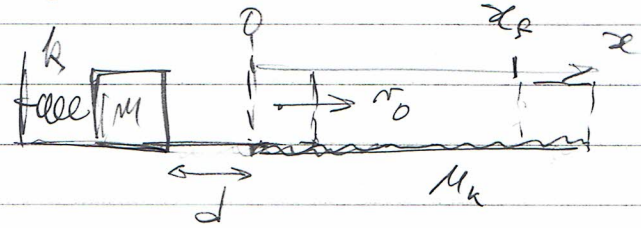
$0{,}5\, v_{fy} = 5 \Rightarrow \boxed{v_{fy} = 10\ m/s} \Rightarrow \vec{v}_f = \left(7{,}4\,\hat{i} + 10\,\hat{j}\right)\frac{m}{s}$

$|\vec{v}_f| = \sqrt{v_{fx}^2 + v_{fy}^2} = \boxed{12{,}4\ \frac{m}{s}}$ $\quad \tan\theta_v = \frac{v_{fy}}{v_{fx}} \Rightarrow \boxed{\theta_v \cong 53°}$

b)

$$\Delta E = \frac{m v_f^2}{2} - \frac{m v_0^2}{2} = \boxed{13{,}4\ J}$$

Ej. 3



a) $\frac{k d^2}{2} = \frac{m v_0^2}{2} \Rightarrow \boxed{v_0 = d\sqrt{\frac{k}{m}}}$

b) $W_{Roz} = -F_k x_f = -\mu_k m g x_f = -\frac{m v_0^2}{2} \Rightarrow$

$$\boxed{x_f = \frac{v_0^2}{2g\mu_k} = \frac{k d^2}{2 m g \mu_k}}$$

c) $v(t) = v_0 + at = d\sqrt{\frac{k}{m}} - \frac{F_k}{m} t = d\sqrt{\frac{k}{m}} - \mu_k g t$ ($F_k = \mu_k m g$)

$v(t_f) = 0 \Rightarrow \boxed{t_f = \frac{d}{\mu_k g}\sqrt{\frac{k}{m}}}$