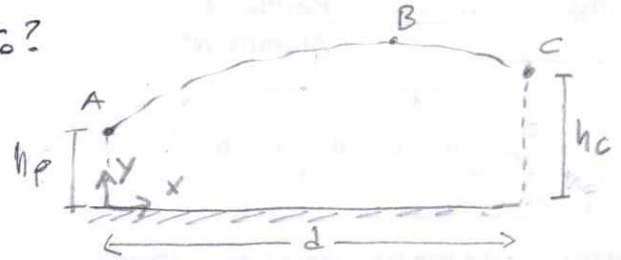
4) $h_p = 2m$; $d = 10m$; $\theta = 40°$; $h_c = 3{,}05m$

a) v_0?



pelota: $\begin{cases} x(t) = v_0 \cos\theta \, t \\ y(t) = h_p + v_0 \operatorname{sen}\theta \cdot t - \frac{1}{2} g t^2 \end{cases}$

canasta $\begin{cases} x(t) = d \\ y(t) = h_c \end{cases}$

$$\begin{cases} x(t_c) = v_0 \cos\theta \cdot t_c = d \\ y(t_c) = h_p + v_0 \operatorname{sen}\theta \cdot t_c - \frac{1}{2} g t_c^2 = h_c \end{cases} \quad (2)$$

$$(1) \Rightarrow t_c = \frac{d}{v_0 \cos\theta} \rightarrow \text{en } (2)$$

$$\Rightarrow h_p + v_0 \operatorname{sen}\theta \cdot \frac{d}{v_0 \cos\theta} - \frac{1}{2} g \left(\frac{d}{v_0 \cos\theta}\right)^2 = h_c$$

$$\Rightarrow h_p - h_c + d \operatorname{tg}\theta = \frac{1}{2} g \frac{d^2}{v_0^2 \cos^2\theta} \Rightarrow v_0 = \frac{d}{\cos\theta} \sqrt{\frac{\frac{1}{2} g}{h_p - h_c + d \operatorname{tg}\theta}} \simeq 10{,}66 \, m/s$$

b) $\Delta \vec{v} \neq 0 \Rightarrow \Delta \vec{p} \neq 0$. En particular $\begin{cases} \Sigma F_x = 0 \Rightarrow \Delta p_x = 0 \\ \Sigma F_y = P \neq 0 \Rightarrow \Delta p_y \neq 0 \end{cases}$

c) $W_{Fnc} = 0 \Rightarrow \Delta E_m = 0$

d) $v_x(t) = v_0 \cos\theta \simeq 8{,}17 \, m/s = cte$

$v_y(t) = v_0 \operatorname{sen}\theta - gt \Rightarrow v_{y_c}(t_c) = v_0 \operatorname{sen}\theta - g \frac{d}{v_0 \cos\theta} \simeq -5{,}14 \, m/s$

$\Rightarrow \vec{v}_c = \langle 8{,}17 ; -5{,}14 \rangle (m/s)$

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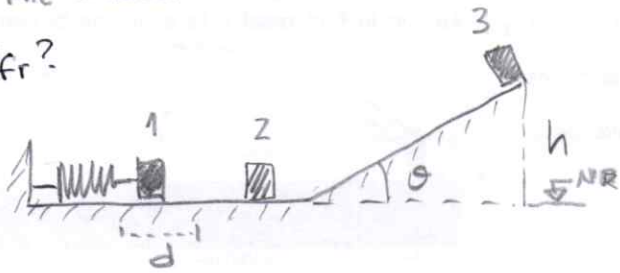
5) $m_1 = 2 \, kg$; $k = 400 \, N/m$; $\theta = 37°$; $d = 0{,}33m$; $h = 0{,}55m$

a) $W_{Fnc} = \Delta E_m$

b) W_{fr}?



TTEm e/1 y 3

$W_{fr} = E_{m3} - E_{m1}$

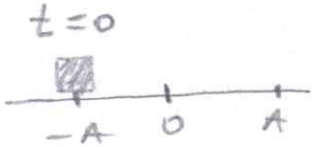
$W_{fr} = mgh - \frac{1}{2} k d^2$

$W_{fr} = -11 \, J$

c) TTEm e/1,2: $0 = E_{m2} - E_{m1} \Rightarrow 0 = \frac{1}{2} m v_2^2 - \frac{1}{2} k d^2$

$\Rightarrow v_2 = \sqrt{\frac{k}{m}} \cdot d \simeq 4{,}67 \, m/s$

d) M.A.S.



$x(t) = A \cos(\omega t + \phi) = d \cos\left[\sqrt{\frac{k}{m}} \, t + \phi\right]$

$x(0) = A \cos(\phi) = -A \Rightarrow \cos\phi = -1 \Rightarrow \phi = \pi$

$x(t) = 10 \cos\left[10\sqrt{2} \, t + \pi\right] \quad (m)$