a) m llega a B con $\frac{1}{2} m v_B^2 = mgh$

$$v_B = \sqrt{2gh}$$

colisión: $\frac{E_c}{p}$: $\overbrace{v_{1i}}^{v_B} + v_{1f} = v_{2f}$ si $v_{2i} = 0$

p: $m(v_{1i} - v_{1f}) = M \cdot v_{2f}$

$$2 v_{1i} = \left(1 + \frac{M}{m}\right) v_{2f} \qquad \boxed{v_{2f} = \frac{2\sqrt{2gh}}{1 + \frac{M}{m}}}$$

$$v_{1i} + v_{1f} = \frac{m}{M}\left(v_{1i} - v_{1f}\right)$$

$$v_{1i}\left(1 - \frac{m}{M}\right) = -v_{1f}\left(1 + \frac{m}{M}\right)$$

$$\boxed{v_{1f} = \frac{m-M}{m+M} \cdot \sqrt{2gh}}$$

b) $\frac{1}{2} m v_{1f}^2 = m g h_2$

$$\boxed{h_2 = \left(\frac{m-M}{m+M}\right)^2 h}$$

c) De $B \to C$ pierde M energía cinética

por $W_{NC} = (\mu_d \cdot Mg) \cdot L$

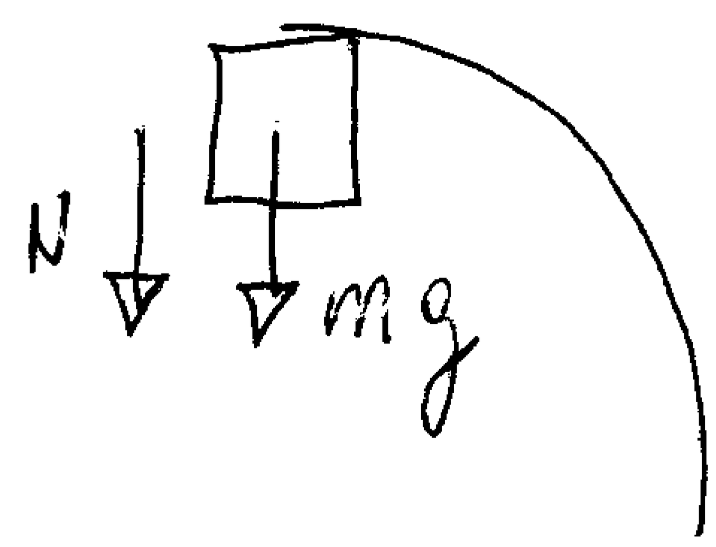
llega a C con:

$$E^{(C)} = \frac{1}{2} M \left[\frac{2\sqrt{2gh}}{1 + M/m} \right]^2 - \mu_d M g L$$

$$= \frac{1}{2} M \frac{8 g h}{(m+M)^2} m^2 - \mu_d M g L$$

Quiero que $N = 0$ para

μ_d máximo:



$$\hat{r}) \quad -MR\dot{\theta}^2 = -Mg - N$$

$$\Rightarrow \quad R\dot{\theta}^2 = g \;\rightarrow\; \dot{\theta} = \sqrt{\frac{g}{R}}$$

en E la energía es cinét + pot:

$$E^{(E)} = \frac{1}{2} M R^2 \dot{\theta}^2 + Mg\, 2R$$

$$\Delta E = 0 \Rightarrow E^{(E)} = E^{(C)}$$

$$\frac{1}{\cancel{2}}\frac{Mm^2}{(m+M)^2}\overset{4}{\cancel{8}}gh - MgL\mu_d = \frac{1}{2}MR^2\left(\frac{g}{R}\right) + Mg2R$$

despejo

$$4\frac{\cancel{M}m^2}{(m+M)^2}\cancel{g}h - 2\cancel{M}\cancel{g}R - \frac{1}{2}\cancel{M}R\cancel{g} = \cancel{M}\cancel{g}L\mu_d$$

$$\boxed{\frac{1}{L}\left[4\frac{m^2}{(m+M)^2}h - \frac{5}{2}R\right] = \mu_d}$$

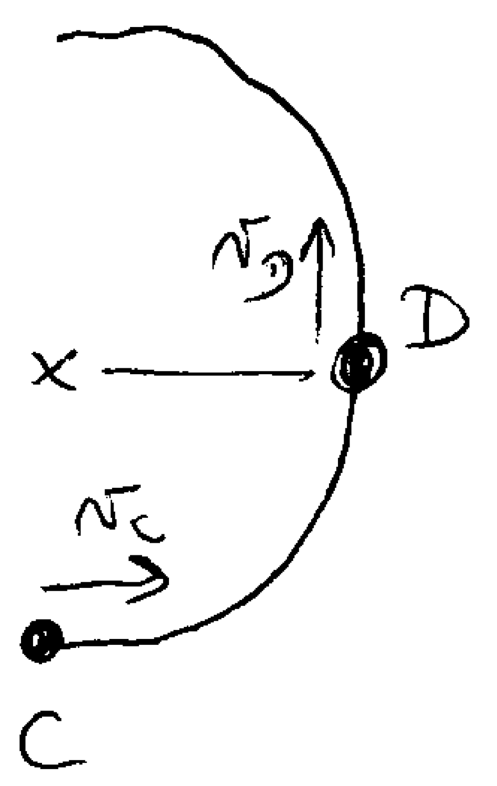
Tomo $2m = M \longrightarrow 4\frac{m^2}{(m+M)^2}h = 4\frac{m^2}{9m^2}h = \frac{4}{9}h$

$h = \frac{9}{4}\cdot 3R \longrightarrow [\;\;] = 3R - \frac{5}{2}R = \frac{R}{2}$

$$\mu_d = \frac{1}{L}\frac{R}{2} = \frac{1}{10} \Rightarrow \frac{1}{L} = \frac{2}{10R}$$

$$\boxed{L = 5R}$$

d)

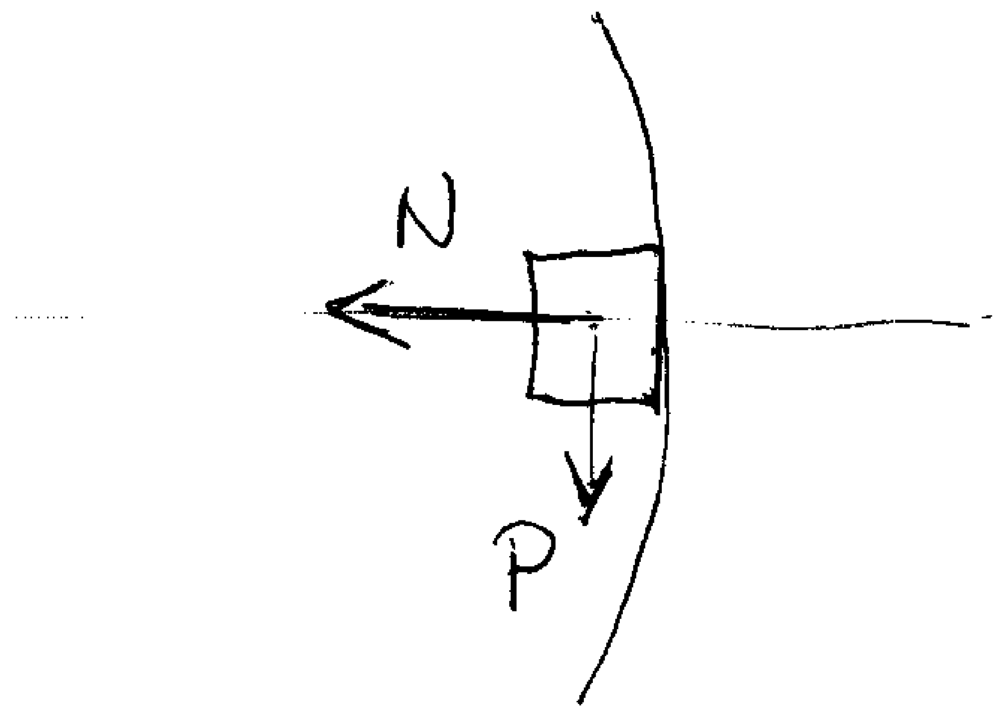


Las velocidades en C y D son diferentes $\Rightarrow$

$$L = r \times p \begin{cases} RMv_D \\ RMv_C \end{cases}$$

Esto se debe a que existe una fuerza que realiza torque <u>EL PESO</u>.

- La fuerza de contacto se calcula con:



$$\hat{r})\ -MR\dot{\theta}^2 = -N$$

$$N = MR\dot{\theta}^2$$

y v_D = sale de conservación de energía entre C y D.

y $v_D = R\dot{\theta}_D$.