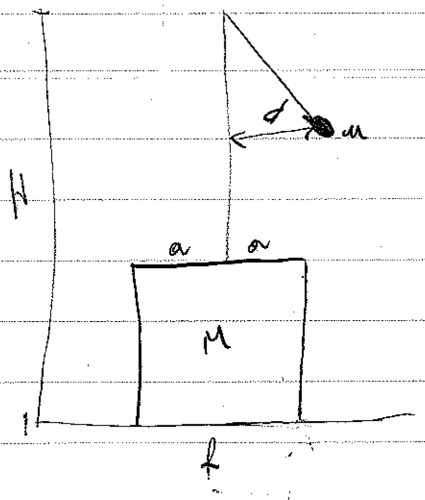
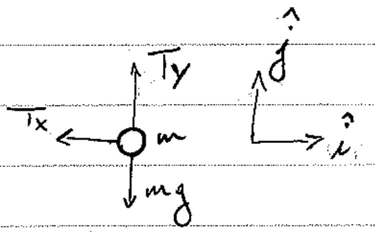
Ejercicio 1



La masa m describe un movimiento circular

a)

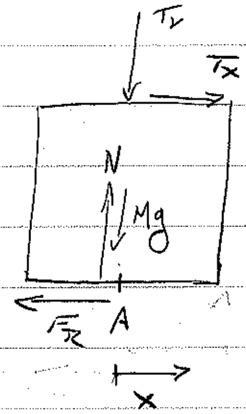
$\hat{j}$) $T_y = mg$ Porque el mov. es a altura cte.



$\hat{i}$) $T_x = m\dfrac{v^2}{d}$

$$\Longrightarrow \vec{T} = m\frac{v^2}{d}\hat{i} + mg\hat{j}$$

b)



$\hat{j}$) $N = (m+M)g$

$\hat{i}$) $T_x = F_R$

$$F_R \leq \mu N$$

$$m\frac{v^2}{d} \leq (m+M)g\mu$$

$$v^2 < \frac{(m+M)}{m} g\mu d$$ Condición para no deslizar.

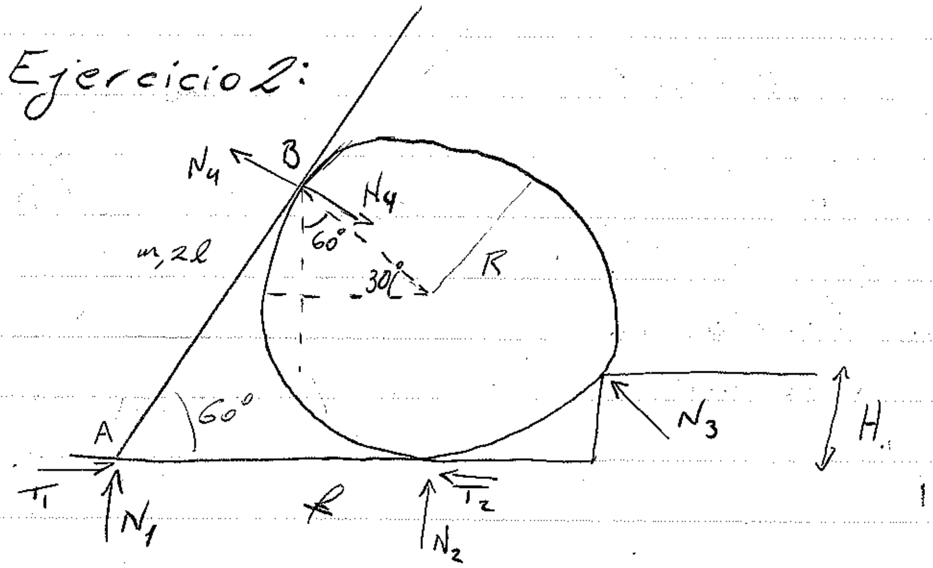
Torque en A:

$$HT_x = Nx$$

$$x = \frac{mv^2H}{(m+M)gd} < a \Longrightarrow v^2 < \frac{(m+M)gda}{mH}$$

Condición de vuelco

Ejercicio 2:



La altura del punto B es $R + R\,\mathrm{sen}(30°) = \frac{3}{2}R$

$$AB = \frac{\frac{3}{2}R}{\mathrm{sen}(60°)} = \sqrt{3}R$$

Torque en A: $M_A = mgl\,\mathrm{sen}(30°) - N_4\sqrt{3}R = 0$

$$\Longrightarrow N_4 = \frac{mgl}{2\sqrt{3}R}$$

$\hat{i})$ $T_1 = N_4\cos(30) \Longrightarrow T_1 = \frac{mgl}{4R}$

$\hat{j})$ $N_1 - mg + N_4\,\mathrm{sen}(30°) = 0$

$$N_1 = mg\left(1 - \frac{l}{4\sqrt{3}R}\right)$$

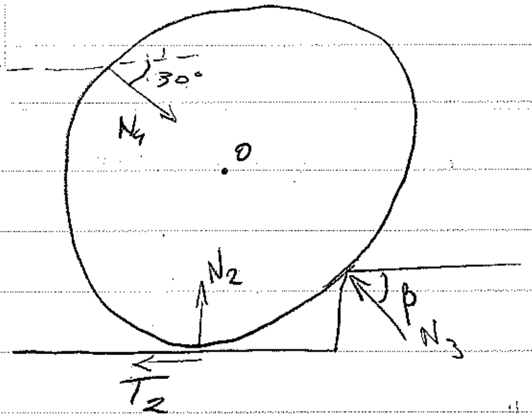
I) Condición para que la barra esté apoyada en el piso

$$N_1 > 0 \Longrightarrow l < 4\sqrt{3}R$$

II) Condición de no deslizamiento

$$T_1 \leq \mu N_1 \Longrightarrow \frac{\sqrt{3}l}{(4\sqrt{3}R - l)} \leq \mu$$

b)



Ya que las fuerzas N_4 y N_3 son radiales

$$M_o = T_2 R = 0 \Longrightarrow T_2 = 0$$

$$\hat{i})\quad N_4 \cos(30) - N_3 \cos\beta = 0$$

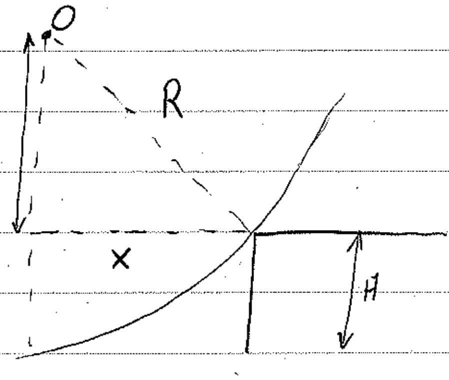
$$\Longrightarrow N_3 = \frac{mgl}{4R\cos\beta}$$

$$\hat{j})\quad N_4 \operatorname{sen}(30) - N_3 \operatorname{sen}\beta - N_2 = 0$$

$$\Longrightarrow N_2 = \frac{mgl}{4\sqrt{3}R} - \frac{mgl}{4R}\operatorname{tg}\beta$$

$$\operatorname{tg}\beta = \frac{oP}{ad} = \frac{R-H}{\left(R^2-(R-H)^2\right)^{1/2}}$$

$$= \frac{R-H}{\left(2RH-H^2\right)^{1/2}}$$



$$x^2 = R^2 - (R-H)^2$$

Condición $N_2 \geq 0$

$$\Longrightarrow \left(\frac{1}{\sqrt{3}} - \operatorname{tg}\beta\right) \geq 0 \Longrightarrow \frac{(2RH-H^2)}{3} \geq (R-H)^2$$

$$\Longrightarrow 0 \geq \underbrace{\left(H - \frac{3}{2}R\right)}_{\text{sin sentido Físico}}\left(H - \frac{R}{2}\right) \Longrightarrow \frac{R}{2} \leq H$$