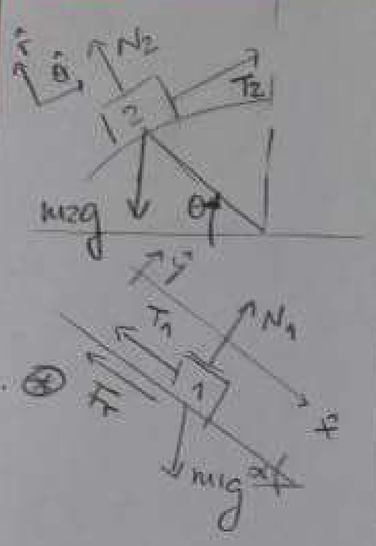


Si m_1 se mueve en $\hat{x}$ positivo

Masa 1 $\quad \hat{x})\quad -T_1 - F_r + m_1 g \,\text{sen}\,\alpha = m_1 \ddot{x}_1$ (1)

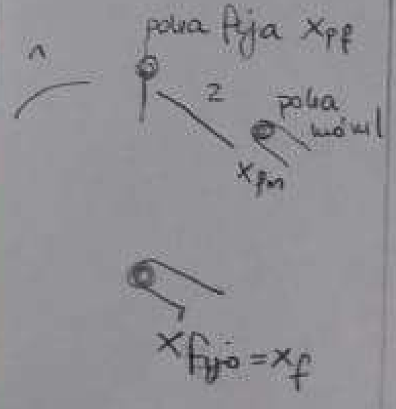
$\hat{y})\quad N_1 - m_1 g \cos\alpha = 0$

$\Rightarrow \boxed{N_1 = m_1 g \cos\alpha}$

Masa 2 $\quad \hat{r})\quad N_2 - m_2 g \,\text{sen}\,\theta = -m_2 R \dot{\theta}^2 \; (= 0)$

$\hat{\theta})\quad T_2 - m_2 g \cos\theta = m R \ddot{\theta}$ (2)

$\boxed{N_2 = m_2 g \,\text{sen}\,\theta}$



Vínculos

Soga 1 $\quad R\left(\frac{\pi}{2} - \theta\right) + x_{pm} - x_{pf} = L_1$

$\Rightarrow \boxed{R\ddot{\theta} = \ddot{x}_{pm}}$

Soga 2 $\quad x_1 - x_{pm} + x_f - x_{pm} = L_2$

$\Rightarrow \boxed{\ddot{x}_1 = 2\ddot{x}_{pm}}$ (A)

De acá $\quad \boxed{2R\ddot{\theta} = \ddot{x}_1}$

Poleas de masa despreciable $\quad \boxed{T_2 = 2T_1}$ (B)

b) $m_1 = m_2$

Uso vínculos (A) y (B) en (1) + 2.(2) $\Rightarrow$

$5mR\ddot{\theta} = 2mg\,\text{sen}\,\alpha - mg\cos\theta - 2F_r \rightarrow$ ecuación de mov

Para que estén en reposo $\ddot{\theta} = 0$ y $F_r = F_{re} \leq \mu_e \cdot N = \text{tg}\,\alpha\, N_1$

$= \text{tg}\,\alpha\, mg\cos\alpha$

$= \text{sen}\,\alpha \cdot mg$

$2F_r = 2mg\,\text{sen}\,\alpha - mg\cos\theta$

$2\cancel{mg}\,\text{sen}\,\alpha - \cancel{mg}\cos\theta \leq 2\mu_e \cancel{mg}\cos\alpha$

$(-)\cos\theta \leq 2\mu_e\cos\alpha - 2\,\text{sen}\,\alpha$

↳ con el sentido de movimiento que asumimos al comienzo. $\Rightarrow \boxed{\cos\theta \geq 2\,\text{sen}\,\alpha - 2\mu_e\cos\alpha}$

Si m_1 se mueve hacia arriba $(m - R) \Rightarrow$

$$+2F_r = -2mg\,\text{sen}\,\alpha + mg\cos\theta$$

$$\Rightarrow \quad mg\cos\theta - 2mg\,\text{sen}\,\alpha \leq 2\mu_e \cdot mg\cos\alpha$$

$$\cos\theta \leq 2\left(\mu_e\cos\alpha + \text{sen}\,\alpha\right)$$

$$2\left(\text{sen}\,\alpha - \mu_e\cos\alpha\right) \leq \cos\theta \leq 2\left(\mu_e\cos\alpha + \text{sen}\,\alpha\right)$$

como $\mu_e = \text{tg}\,\alpha \Rightarrow \mu_e\cos\alpha = \text{sen}\,\alpha$

$$\Rightarrow \quad 0 \leq \cos\theta \leq 4\,\text{sen}\,\alpha$$

$\theta_0 = 0 \qquad \dot{\theta}_0 = \dfrac{V_0}{R}$

$\ddot{\theta} = \dot{\theta}\dfrac{d\dot{\theta}}{d\theta}$ uso esto en la ec. de mov.

$$5mR\ddot{\theta} = 2mg\,\text{sen}\,\alpha - mg\cos\theta - 2F_r$$

$$\Rightarrow 5mR\int_{V_0/R}^{\dot{\theta}}\dot{\theta}\,d\dot{\theta} = \int_0^{\theta}\left(2mg\,\text{sen}\,\alpha - 2\mu_d\,mg\cos\alpha - mg\cos\theta\right)d\theta$$

$$\frac{5R}{2}\left(\dot{\theta}^2 - \frac{V_0^2}{R^2}\right) = 2g\theta\left(\text{sen}\,\alpha - \mu_d\cos\alpha\right) - g\,\text{sen}\,\theta$$

$$\boxed{\dot{\theta}^2 = \frac{4g}{5R}\left(\text{sen}\,\alpha - \mu_d\cos\alpha\right)\theta - \frac{2g}{5R}\,\text{sen}\,\theta + \frac{V_0^2}{R^2}}$$