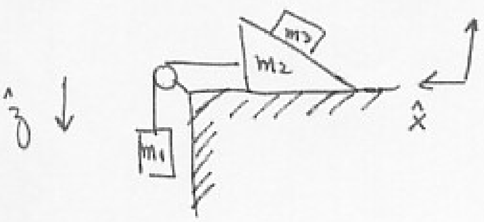
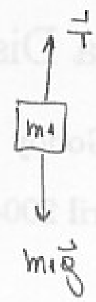
Pauta Ej. 7



DCL m_1

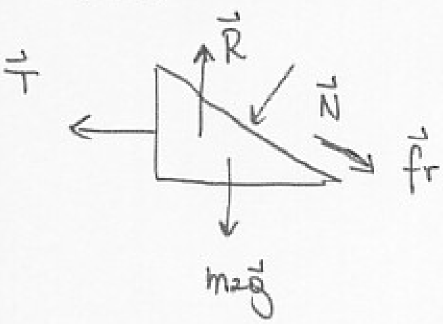


$$\sum \vec{F} = m_1 \vec{a}_1$$

$\hat{z}\rfloor$

$$-T + m_1 g = m_1 \ddot{z} \quad (1)$$

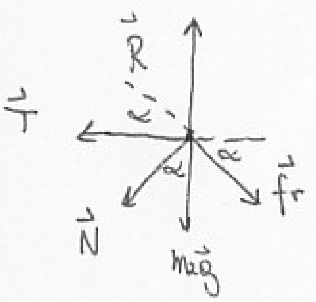
DCL m_2



$\vec{R}$: reacción piso

$\vec{N}$: normal debido a m_3

$\vec{fr}$: fuerza roce.



$$\sum \vec{F} = m_2 \vec{a}_2$$

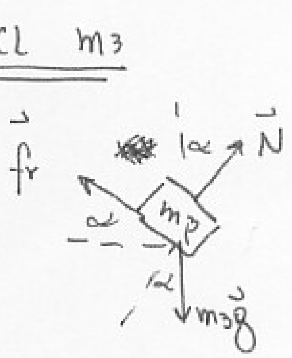
$\hat{x}\rfloor$

$$T - fr\cos\alpha + N\operatorname{sen}\alpha = m_2 \ddot{x}_2 \quad (2)$$

$\hat{y}\rfloor$

$$R - m_2 g - N\cos\alpha - fr\operatorname{sen}\alpha = m_2 \cancel{\ddot{y}_2}^{\,0} = 0 \quad (3)$$

DCL m_3



$$\sum \vec{F} = m_3 \vec{a}_3$$

$\hat{x}\rfloor$

$$fr\cos\alpha - N\operatorname{sen}\alpha = m_3 \ddot{x}_3 \quad (4)$$

$\hat{y}\rfloor$

$$N\cos\alpha - m_3 g + fr\operatorname{sen}\alpha = m_3 \ddot{y}_3 \quad (5)$$

Como queremos que $fr = 0 = \mu \cdot N \Rightarrow N = 0$

$\Rightarrow$ (2) $\Rightarrow$ $\boxed{T = m_2 \ddot{x}_2}$ (2')

(3) $\Rightarrow$ $R - m_2 g = 0$

(4) $\Rightarrow$ $0 = m_3 \ddot{x}_3 \Rightarrow \ddot{x}_3 = 0$

(5) $\Rightarrow$ $-m_3 g = m_3 \ddot{y}_3 \Rightarrow \boxed{\ddot{y}_3 = -g}$ (5')

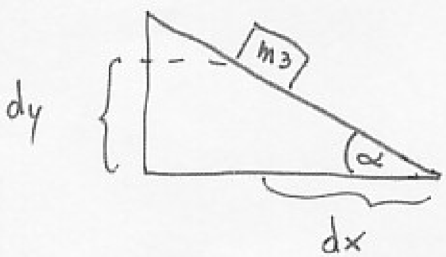
(5') ⇒ q' el cuerpo de masa m_3 cae libremente. La condición que debemos imponer es que al caer m_3 no toque a m_2. Antes, notemos que $\ddot{z} = \ddot{x}_2 = \ddot{x}$

$$\Rightarrow \quad -T + m_1 g = m_1 \ddot{z} = m_1 \ddot{x}$$
$$T = m_2 \ddot{x}$$

$$\Rightarrow \quad \boxed{m_1 g = (m_1 + m_2)\ddot{x}}$$

No conocemos m_1
m_1 $\ddot{x}$

Entonces:



Queremos que m_3 recorra

$dy = \frac{1}{2} g \cdot t^2$ en el mismo tiempo

en que m_2 recorre:

$$dx = \frac{1}{2}\ddot{x}\, t^2$$

Notar que

$$\frac{dy}{dx} = tg\,\alpha \Rightarrow \frac{\frac{1}{2} g \cdot t^2}{\frac{1}{2}\ddot{x}\, t^2} = tg\,\alpha$$

$$\Rightarrow tg\,\alpha = \frac{g}{\ddot{x}}$$

$$\Rightarrow \boxed{\ddot{x} = g \cdot \cot(\alpha)}$$

$$\Rightarrow \quad m_1 g = (m_1 + m_2)\ddot{x} \Rightarrow m_1 \cancel{g} = (m_1 + m_2)\cancel{g}\cot(\alpha)$$

$$\Rightarrow m_1(1 - \cot(\alpha)) = m_2 \cdot \cot(\alpha)$$

$$\Rightarrow \boxed{m_1 = \frac{m_2 \cot(\alpha)}{1 - \cot(\alpha)} = \frac{m_2}{(tg(\alpha) - 1)}}$$