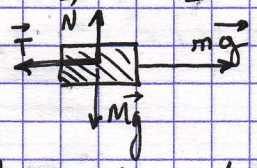
ORME 22 - Frottement solide.

θ_0 φ φ

$\cos\alpha_1 = \frac{2}{3}$

1. 1ère phase : accélérée : $x \in [0, h]$

TEM à $\{M+m\}$: $\Delta E_m = \frac{1}{2}(M+m)V_{max}^2 + mgh = W(\vec{f_r}^{ext}) = -T \times h$.

PFD sur M : 

$M\vec{a} = \vec{T} + \vec{N} + M\vec{g}$ $\xrightarrow{\text{proj}}$ $\begin{cases} Ma = Mg - T \\ 0 = -Mg + N \end{cases}$

Loi de Coulomb du glissement $f = \frac{|T|}{(N)} \rightarrow T = Mgf$

$\rightarrow \Delta E_m = -Mghf = \frac{1}{2}(M+m)V_{max}^2 - mgh \Longrightarrow V_{max} = \sqrt{\frac{2gh(m - fM)}{m+M}}$

2e phase : freinage : $x \in [h, d]$

TEM à $\{M\}$: $\Delta E_M = -\frac{1}{2}MV_{max}^2 = -Td = -Mgfd$

$\downarrow$ $d = \frac{V_{max}^2}{2gf} = \frac{h(m - fM)}{f(m+M)}$ $\quad fd(m+M) = hm - fhM \rightarrow f = \frac{hM}{d(m+M) + hM}$

3 - ① $\Delta E_m = \frac{1}{2}(M+m)V_{max}^2 + \frac{1}{2}J\frac{V_{max}^2}{r^2} - mgh = -Th \rightarrow V_{max} = \sqrt{\frac{2gh(m - fM)}{(M+m+\frac{J}{r^2})}}$

② Pas de changement car fil détendu