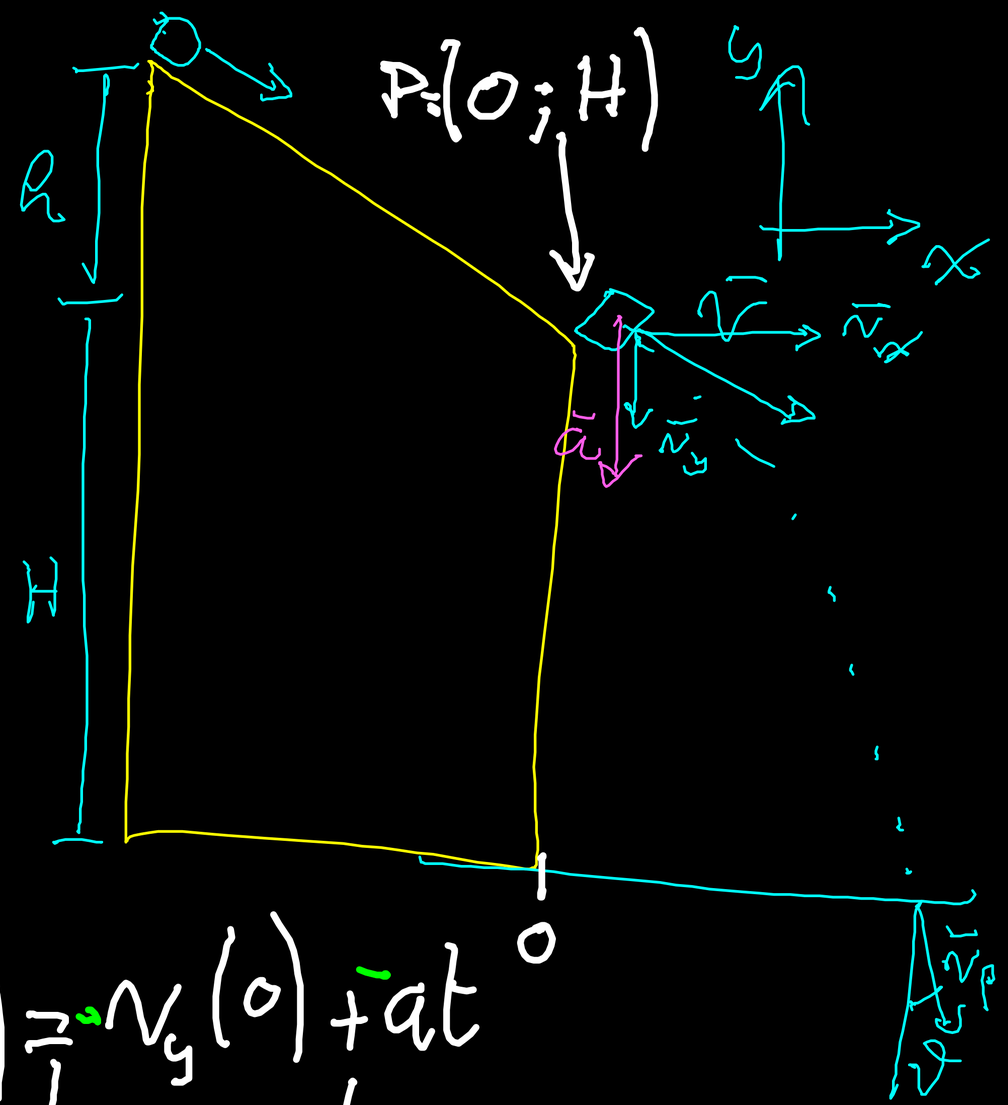
Problema I 12.07.18

$\bar{v} = (3.21\,\hat{i} \ominus 1.85\,\hat{j})\ m/s$

$\bar{a} = (0\,\hat{i} \ominus 9.81\,\hat{j})\ m/s^2$



x: moto rettil. unif.

$v_x = 3.21\ m/s$

y: moto unif. accel.

$y(t) = y(0) + v_y t + \frac{1}{2} a t^2$

$0 = H \oplus v_y t \oplus \frac{1}{2} a t^2$

$0 = H - v_y t - \frac{1}{2} g t^2$

$v_y(t) = v_y(0) + \bar{a} t$

$= v_y + g t$

$t = \frac{v_y(t) - v_y(0)}{g}$

Problema I 12.07.18

$\bar{v} = (3.21\,\hat{i} - 1.85\,\hat{j})\ m/s$

$\bar{a} = (0\,\hat{i} - 9.81\,\hat{j})\ m/s^2$

$\vartheta = \tan^{-1}\left(\frac{v_x}{v_y}\right)$

$= 29°$

$H = v_y(0)\frac{(v_y(t) - v_y(0))}{g} + \frac{1}{2}g\frac{(v_y(t) - v_y(0))^2}{g^2}$

$gH = v_y(t)v_y(0) - \frac{1}{2}v_y^2(0) + \frac{1}{2}v_y^2(t) - v_y(t)v_y(0) + \frac{1}{2}v_y^2(0)$

$2gH = v_y^2(t) - v_y^2(0)$

$v_y(t) = \sqrt{2gH + v_y^2(0)} = 5.73\ m/s$

$0 = H - v_y(0)t - \frac{1}{2}gt^2$

$v_y(t) = v_y(0) + \bar{a}t$

$= v_y + gt$

$t = \frac{v_y(t) - v_y(0)}{g}$

Problema I 12.07.18

$\vartheta = \tan^{-1}\left(\frac{v_x}{v_y}\right) \simeq 29°$

$\bar{v} = (3.21\,\hat{i} - 1.85\,\hat{j})\ m/s$

$\bar{a} = (0\,\hat{i} - 9.81\,\hat{j})\ m/s^2$

$\mu = ?$ per blocco fermo

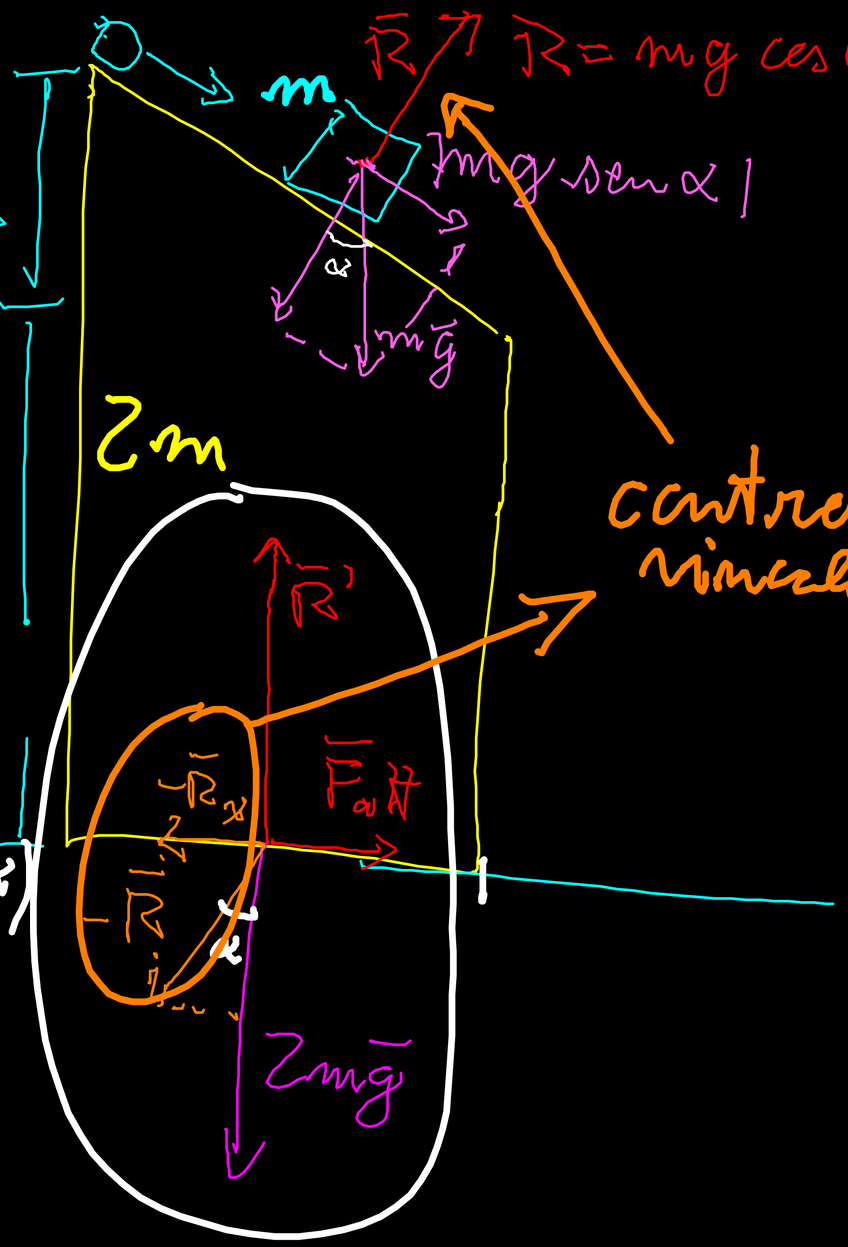
massa blocco $M = 2m$

$y: \quad 2mg + R\cos\alpha = R' = 2mg + mg\cos^2\alpha$

$x: \quad R\sin\alpha = F_{att} = \mu R' = \mu(2mg + mg\cos^2\alpha)$

$$\mu = \frac{mg\cos\alpha\sin\alpha}{2mg + mg\cos^2\alpha} = \frac{\cos\alpha\sin\alpha}{2+\cos^2\alpha}$$

$\simeq \boxed{0.16}$



Corpo trascinato

$m = 20\,Kg$, $\mu = 0.20$

$F = 100\,N$, $\alpha = 60°$

$a = ?$ Reaz. vincolare $= ?$

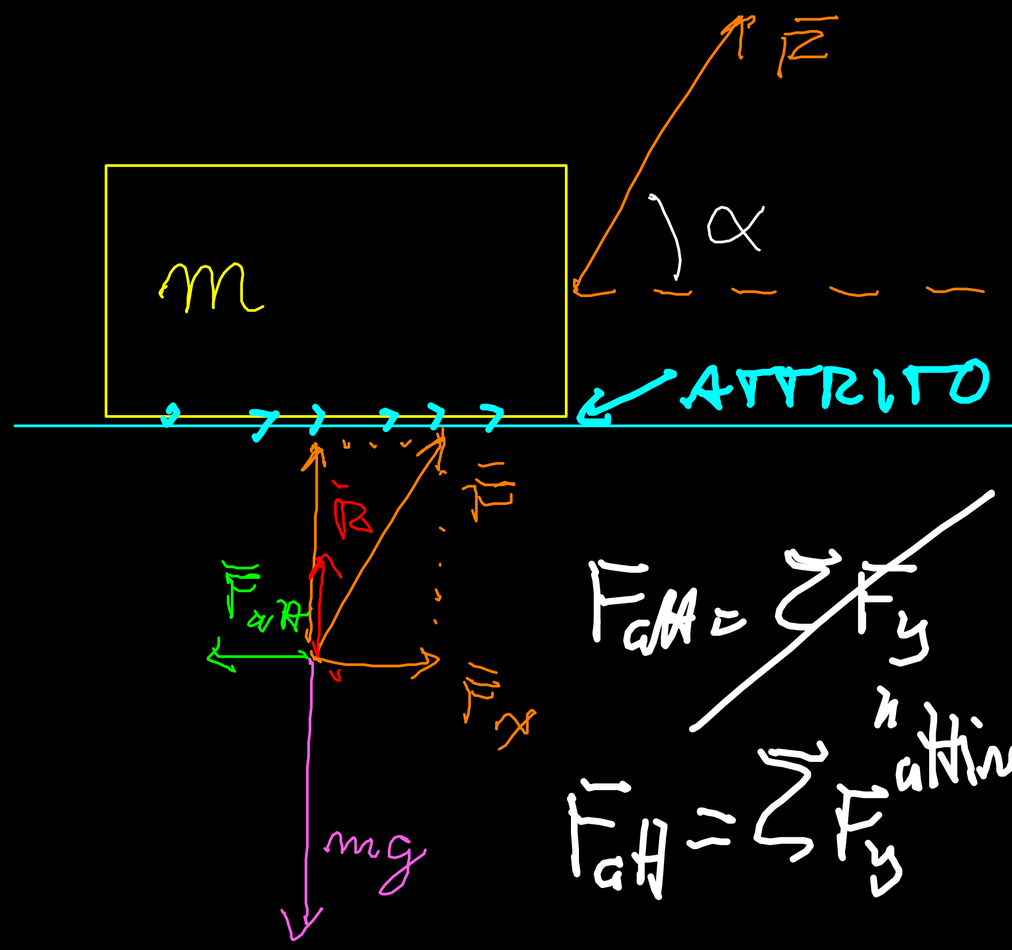
$\sum \bar{F} = m\bar{a}$ ← direttaa lungo x

$$\begin{cases} F_x - F_{att} = ma \\ F_y - mg = R \end{cases}$$

$F_{att} = \mu R$

$$\begin{cases} F\cos\alpha - \mu R = ma \\ R = F\sin\alpha - mg \end{cases}$$

$$\begin{cases} a = \dfrac{F\cos\alpha - \mu R}{m} = \boxed{1.4\ m/s^2} \\ R = 109.6\,N = \boxed{1.1\times10^2\,N} \end{cases}$$



$F_{att} = \sum F_y$

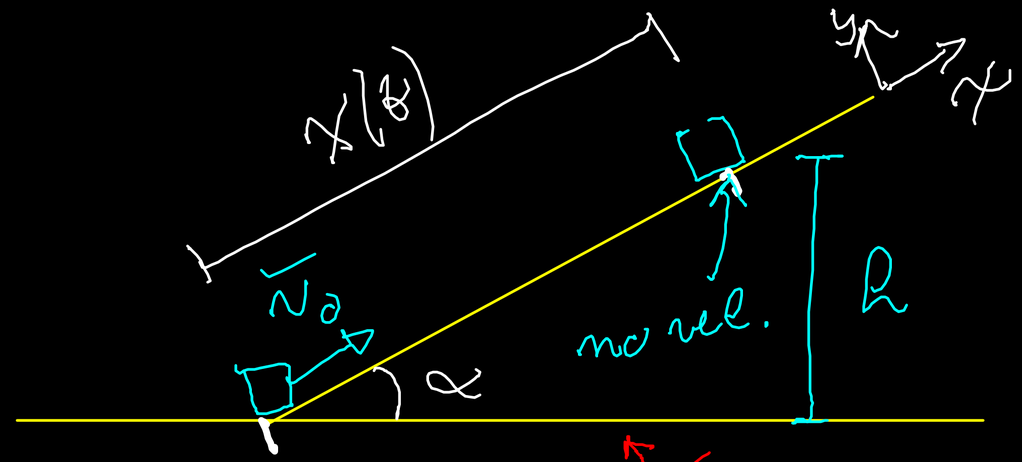
$F_{att} = \sum F_y^{attive}$

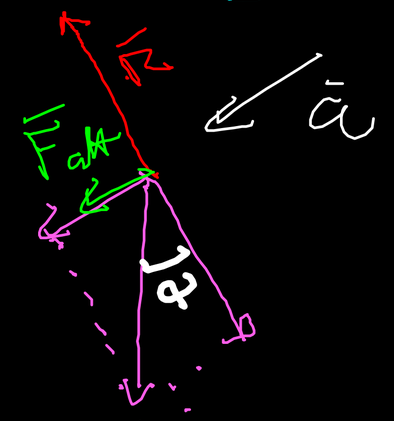
Corpo su piano inclinato in salita

$\alpha = 20°$ corpo lanciato su p.i.

$v_0 = 10\,m/s$ attr. din. $\mu = 0.25$

$h = ?$ corpo fermo



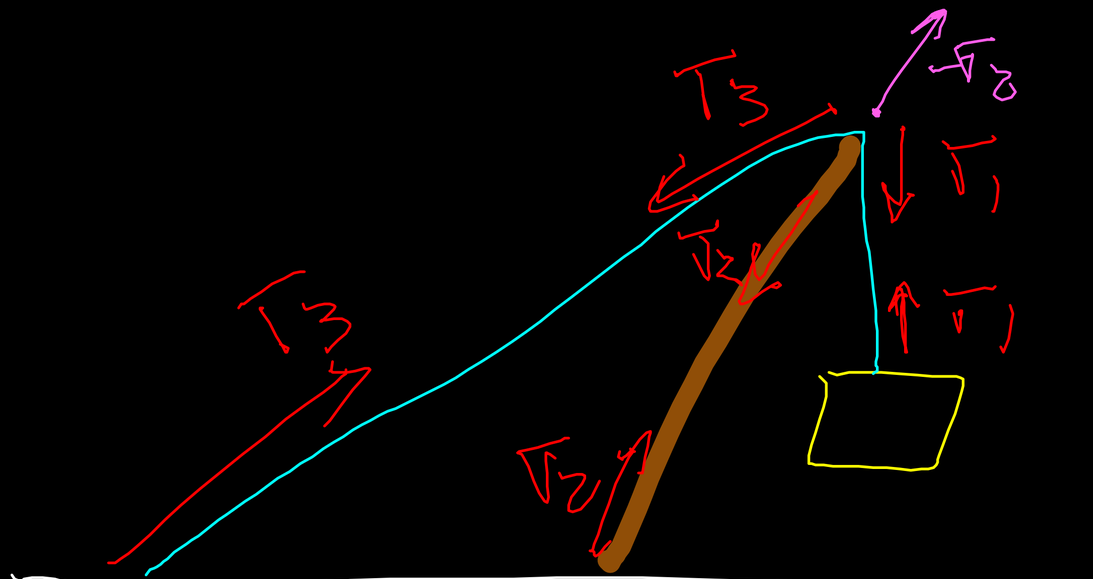


$ma = F_{att} + mg\sin\alpha \qquad \vec{F}_{att} = \mu R = \mu mg\cos\alpha$

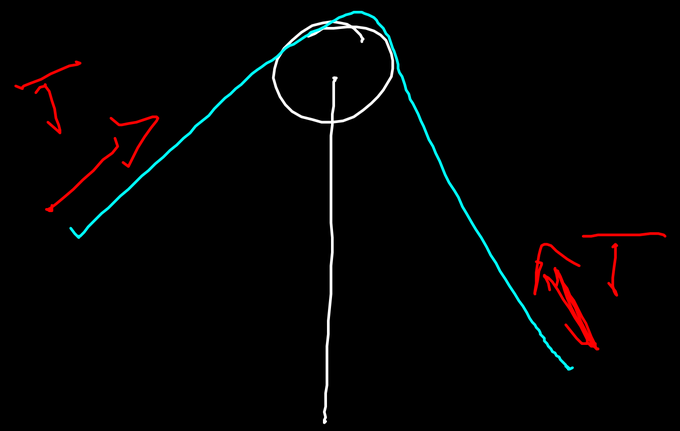
$a = \dfrac{\mu mg\cos\alpha + mg\sin\alpha}{m} = g(\mu\cos\alpha + \sin\alpha) = 5.199\,m/s$

$$\begin{cases} v(t) = v_0 - at \\ x(t) = x(0) + v_0 t - \frac{1}{2}at^2 \end{cases} \qquad \begin{cases} t = v_0/a = 1.92\,s \\ x(t) = v_0 t - \frac{1}{2}at^2 = 15.28\,m \end{cases}$$

$h = x(t)\sin\alpha = \boxed{5.2\,m}$



"STATICO"



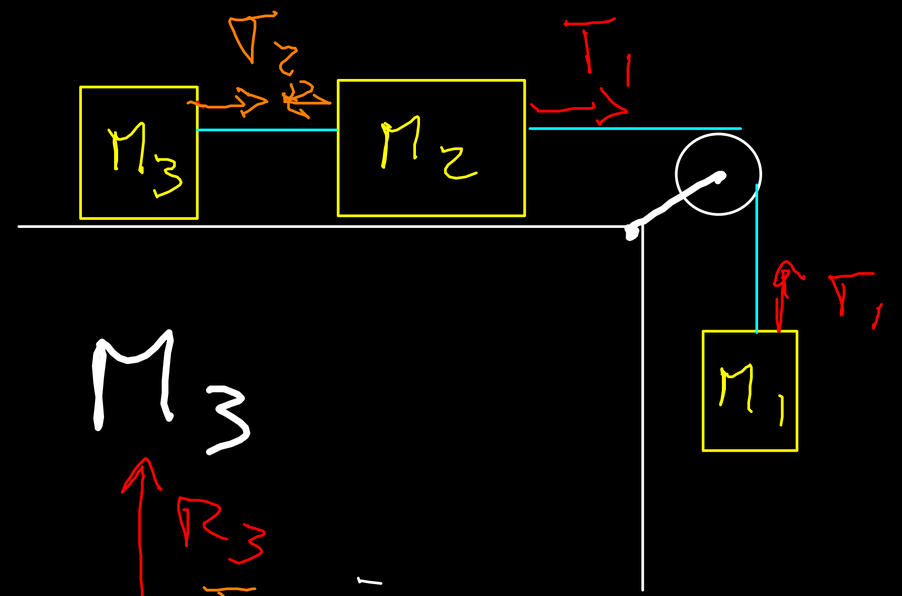
"DINAMICO"

STESSE TENSIONI

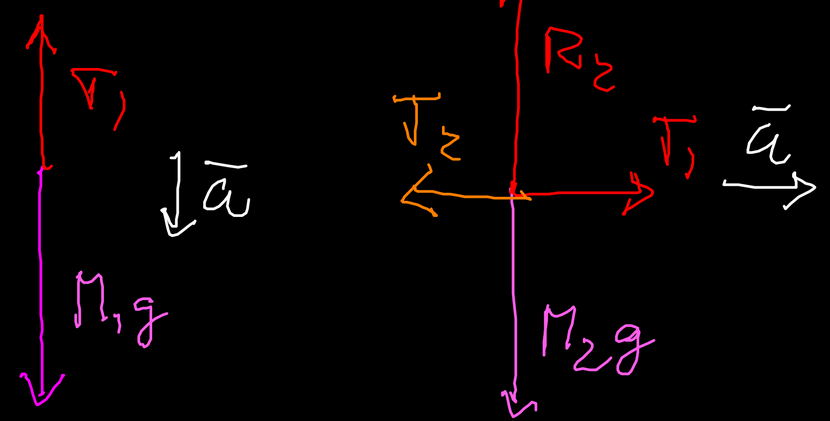
Tre corpi con puni

$M_1 = 4.0\,Kg$, $M_2 = 1.0\,Kg$, $M_3 = 3.0\,Kg$

$\bar{T}_{1,2} = ?$



M_1 M_2 M_3



$T_2 < T_1$

1) $M_1 g - \bar{T}_1 = M_1 a$

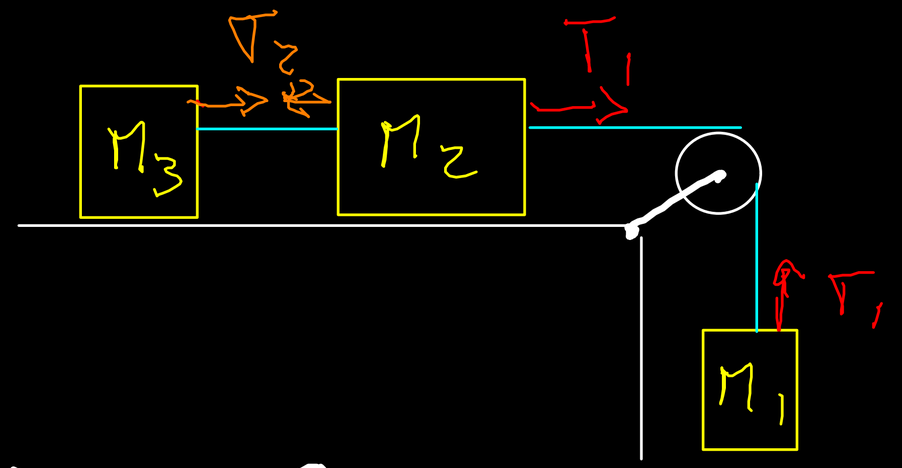
2) $\begin{cases} \bar{T}_1 - \bar{T}_2 = M_2 a \\ M_2 g = R_2 \end{cases}$

3) $\begin{cases} \bar{T}_2 = M_3 a \\ M_3 g = R_3 \end{cases}$

Tre carrelli con puntiformi

$m_1 = 4.0\ kg$, $m_2 = 1.0\ kg$, $m_3 = 3.0\ kg$

$\vec{T}_{1,2} = ?$



$$\begin{cases} m_1 g - T_1 = m_1 a \\ T_1 - m_3 a = m_2 a \\ T_2 = m_3 a \end{cases} \quad \begin{cases} m_1 g - a(m_2 + m_3) = m_1 a \\ T_1 = a(m_2 + m_3) \\ T_2 = m_3 a \end{cases} \quad \begin{cases} a = g \dfrac{m_1}{m_1 + m_2 + m_3} = \boxed{4.9\ m/s^2} \\ T_1 = \boxed{20\ N} \\ T_2 = \boxed{15\ N} \end{cases}$$

1) $m_1 g - T_1 = m_1 a$

$T_2 < T_1$

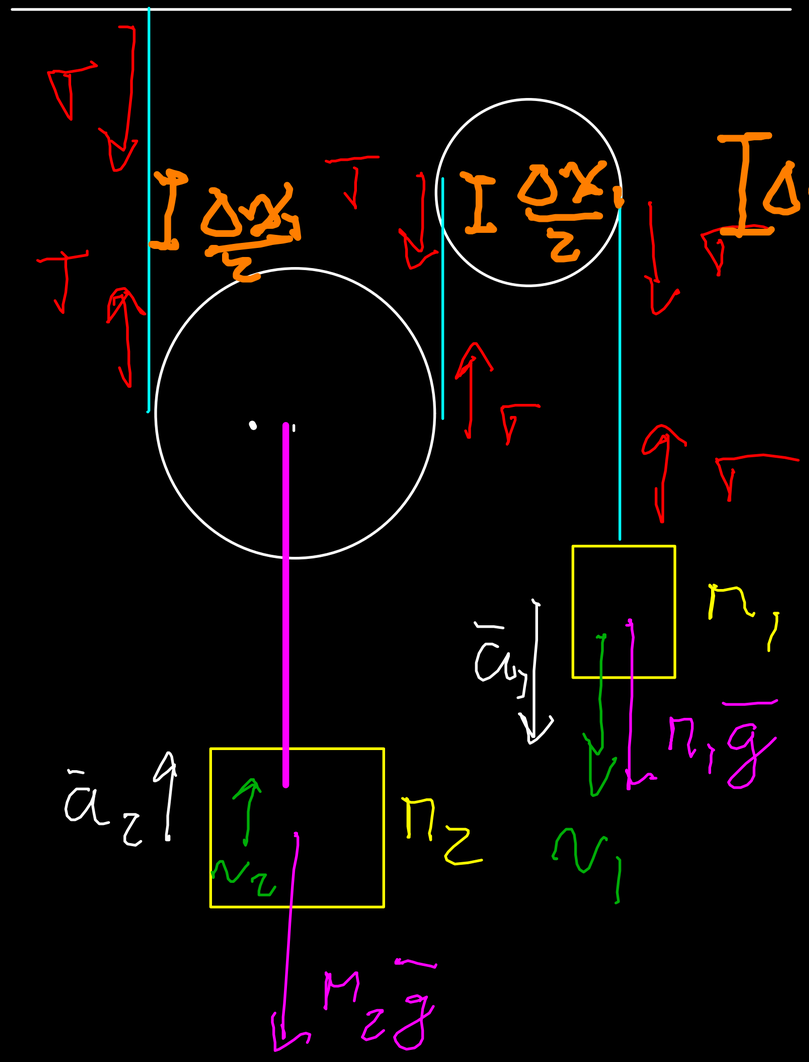
2) $\begin{cases} T_1 - T_2 = m_2 a \\ m_2 g = R_2 \end{cases}$

3) $\begin{cases} T_2 = m_3 a \\ m_3 g = R_3 \end{cases}$

Carrucola

$m_1 = 3.0\ kg$, $m_2 = 4.0\ kg$

$T = ?$



partenza: ~~supponga~~ sia m_1 a muoversi verso il basso!

→ cavo inestensibile

→ $\frac{1}{2}\Delta\omega_1 = \Delta\omega_2$

$\frac{\Delta\omega_1}{\Delta t} = \alpha_1 = 2\alpha_2$

$\frac{\Delta v}{\Delta t} = a_1 = 2a_2$

Carrucola

$m_1 = 3.0\ kg$, $m_2 = 4.0\ kg$

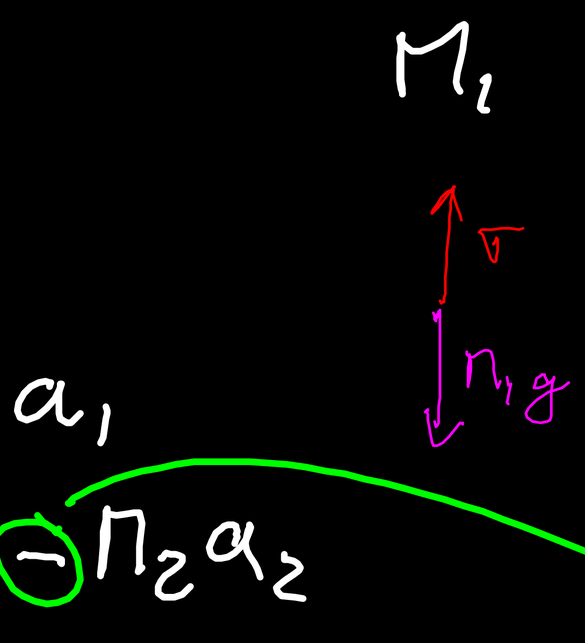
$T = ?$

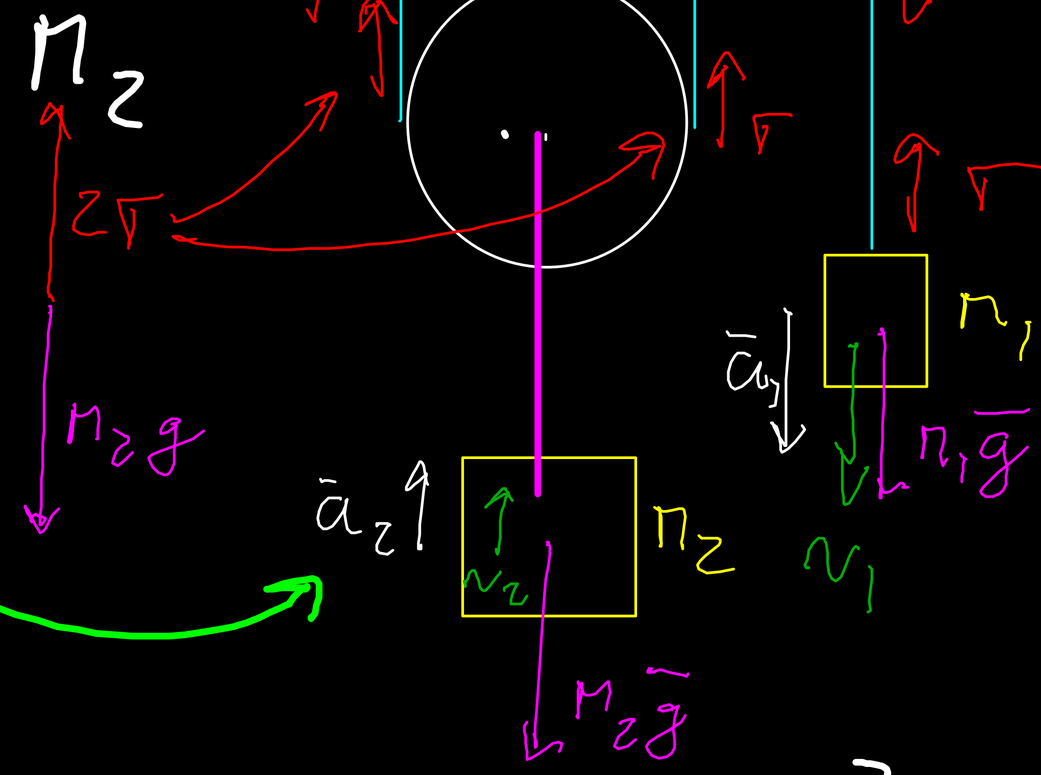
$$\boxed{a_1 = 2a_2}$$

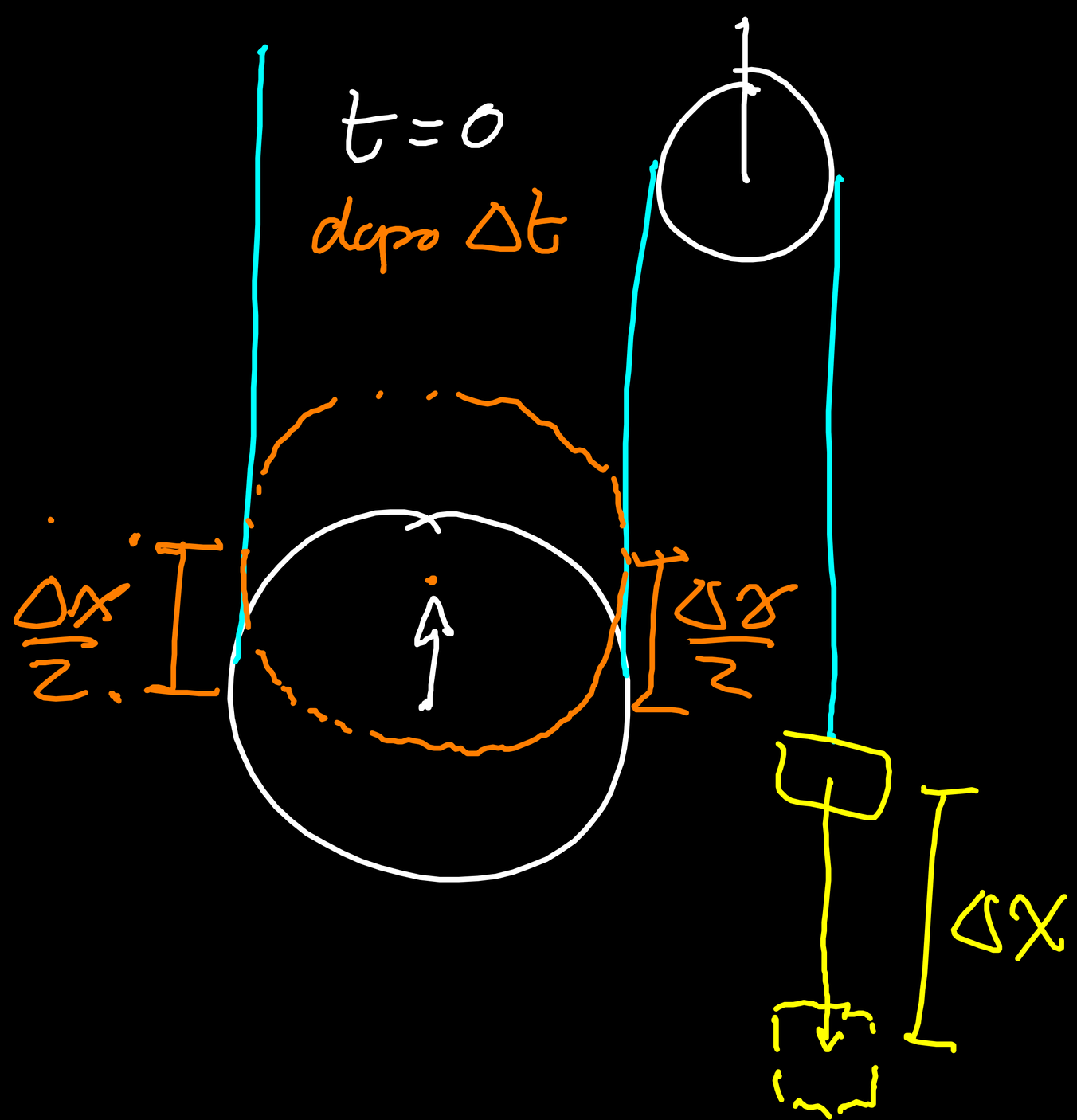
$$\begin{cases} \sum m_1 g - T = m_1 a_1 \\ m_2 g - 2T = -m_2 a_2 \end{cases}$$

$$\begin{cases} T = m_1 (g - 2a_2) \\ m_2 g - 2m_1 g + 4m_1 a_2 = -m_2 a_2 \end{cases}$$

$$g(2m_1 - m_2) = a_2 (m_2 + 4m_1) \rightarrow \begin{cases} a_2 = g \dfrac{2m_1 - m_2}{m_2 + 4m_1} = 1{,}23\ m/s^2 \\ T = \boxed{22\ N} \end{cases}$$






t=0
dopo Δt
Δx/2
T
T
Δx/2
Δx