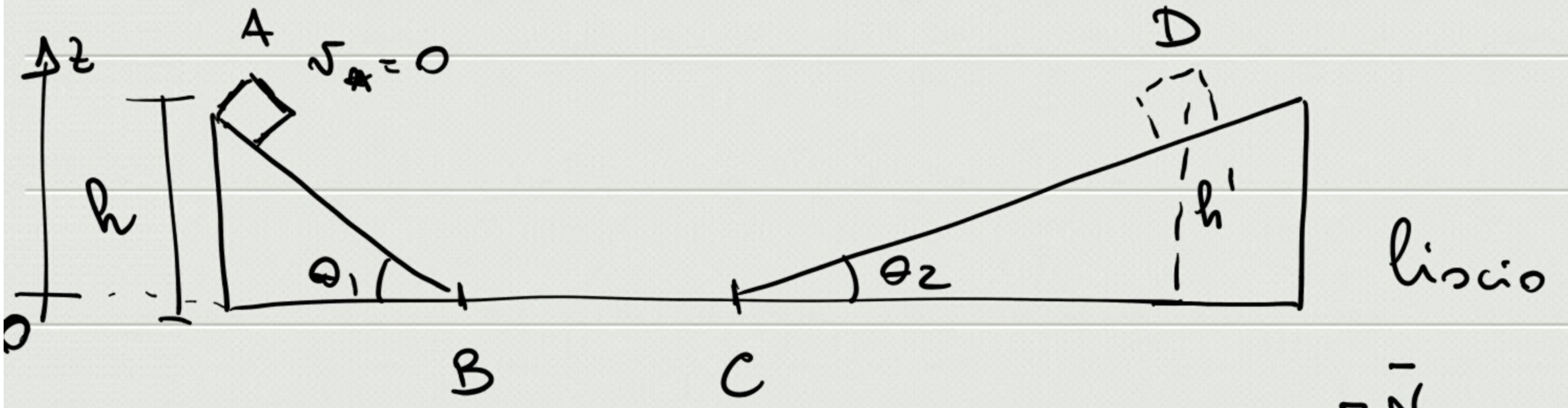
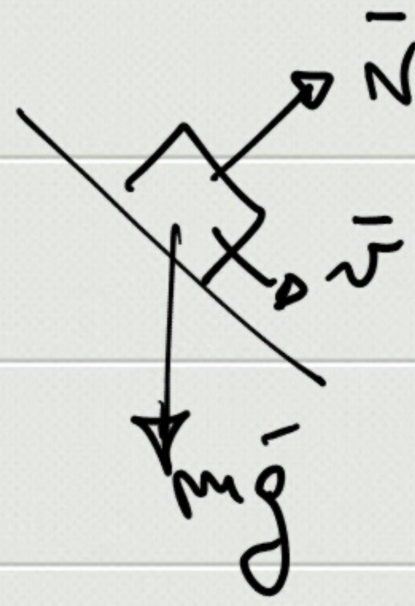


v_B, v_C, h'



forze cons. $\Rightarrow$ $\boxed{E_M = \text{cost}}$

$$E_{M,A} = E_{K,A} + E_{P,A} = \cancel{0} + mgh = mgh \qquad \hookrightarrow h = z_A$$

$$E_{M,B} = E_{K,B} + E_{P,B} = \frac{1}{2} m v_B^2 + \cancel{0} = \frac{1}{2} m v_B^2 \Bigg\} \Rightarrow$$

$$\overset{!}{=} E_{M,A} = mgh$$

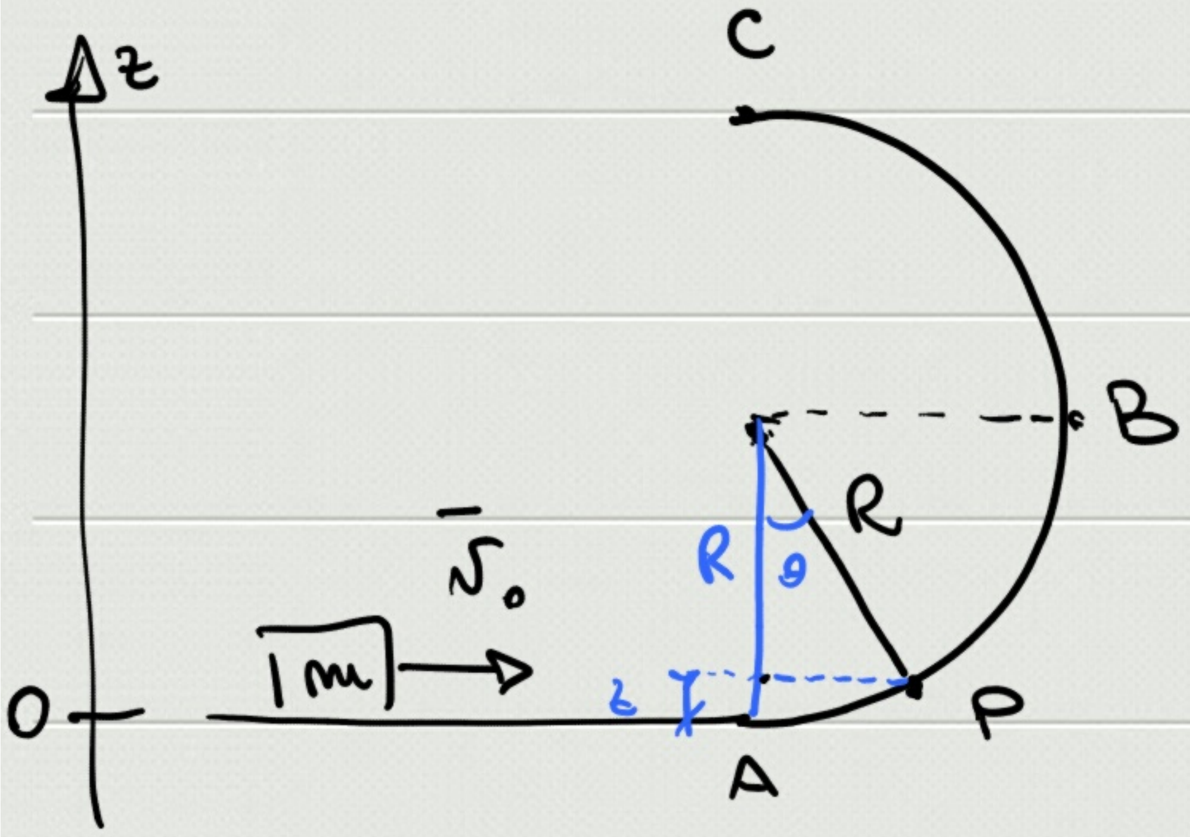
$$\Rightarrow v_B = \sqrt{2gh}$$

$$E_{M,C} = E_{K,C} + E_{P,C} = \frac{1}{2} m v_C^2 \Bigg\} \Rightarrow v_C = v_B$$

$$\overset{!}{=} E_{M,B} = \frac{1}{2} m v_B^2$$

$$E_{M,D} = E_{K,D} + E_{P,D} = \cancel{0} + mgh' \Bigg\} \boxed{h' = h}$$

$$\overset{!}{=} E_{M,A} = mgh$$



v_B, v_C

N_B, N_C

liscio ⇒ solo forze cons.

$$\boxed{E_m = \text{cost}} \qquad \boxed{E_{m,in} = \frac{1}{2} m v_0^2}$$

$$E_{m,P} = E_{K,P} + E_{pot,P} = \frac{1}{2} m v^2 + mgz$$

$$z = R - R\cos\theta = R(1-\cos\theta)$$

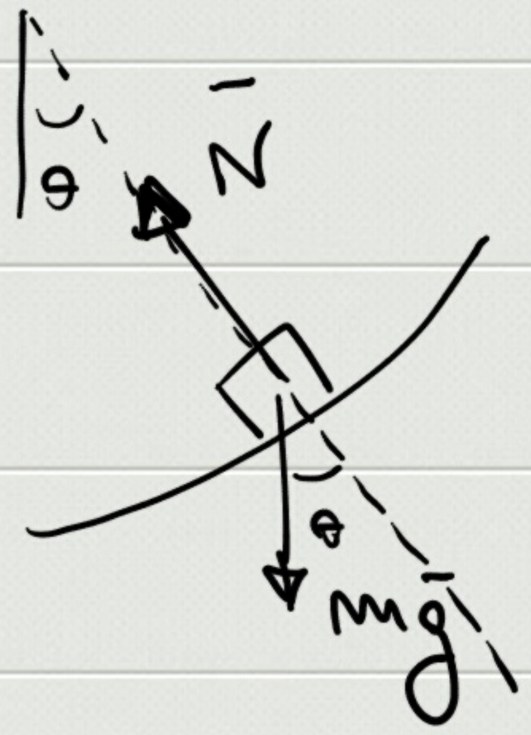
$$E_{m,P} = \frac{1}{2} m v^2(\theta) + mgR(1-\cos\theta)$$

$$= \frac{1}{2} m v_0^2$$

$$\Rightarrow v(\theta) = \sqrt{v_0^2 - 2gR(1-\cos\theta)}$$

$$v_B = v\left(\theta = \frac{\pi}{2}\right) = \sqrt{v_0^2 - 2gR}$$

$$v_C = v(\theta = \pi) = \sqrt{v_0^2 - 4gR}$$



$$\vec{N} + m\vec{g} = m\vec{a}$$

$$\vec{e}_N : \quad N - mg\cos\theta = m a_N = m\frac{v^2}{R}$$

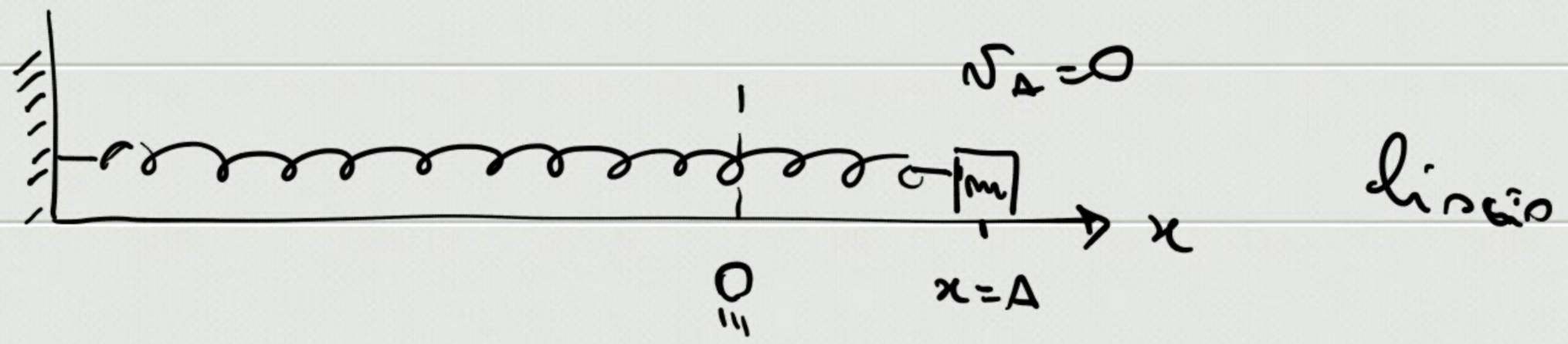
$$\Rightarrow N(\theta) = m\frac{v^2(\theta)}{R} + mg\cos\theta$$

$$N_B = N\left(\theta = \frac{\pi}{2}\right) = \frac{m}{R}\left(v_0^2 - 2gR\right)$$

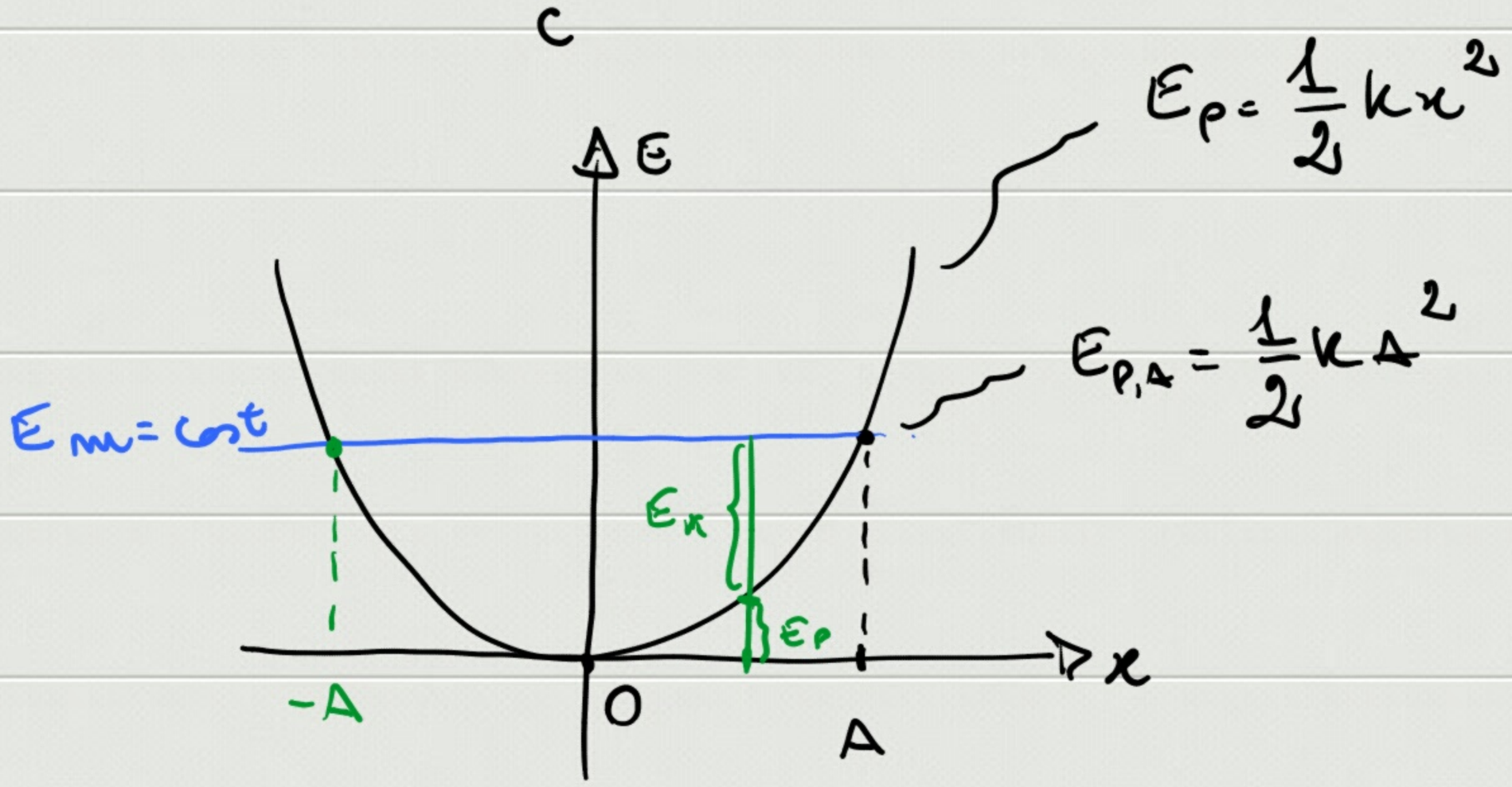
$$N_C = N(\theta = \pi) = \frac{m}{R}\left(v_0^2 - 4gR\right) - mg = m\left(\frac{v_0^2}{R} - 5g\right)$$

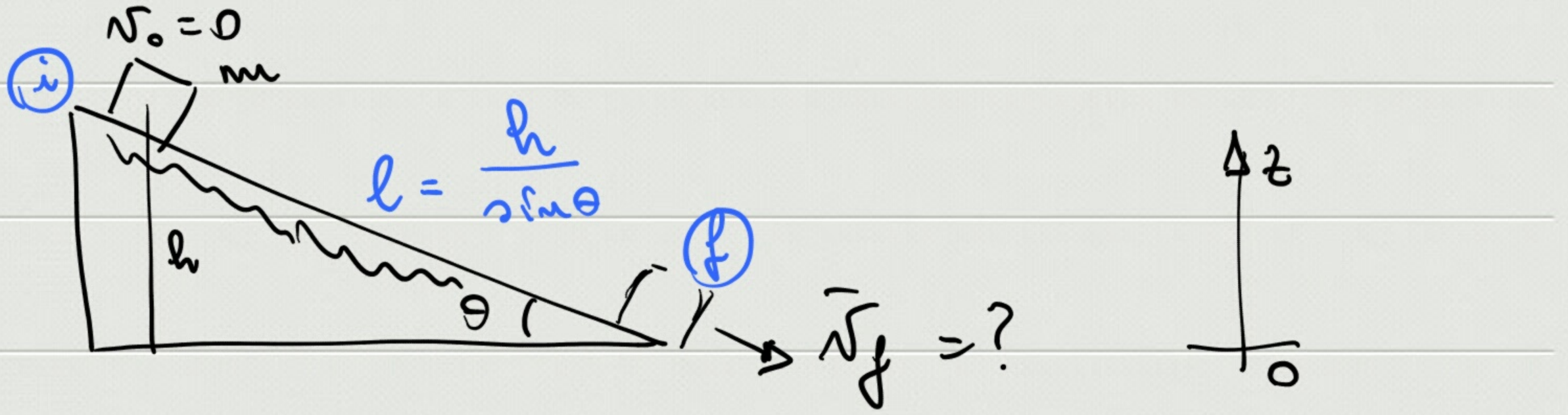
$v_{0,min} = ?$ $\quad \Rightarrow N_C = 0$

$$\Rightarrow v_{0\,(min)} = \sqrt{5gR}$$



lineare

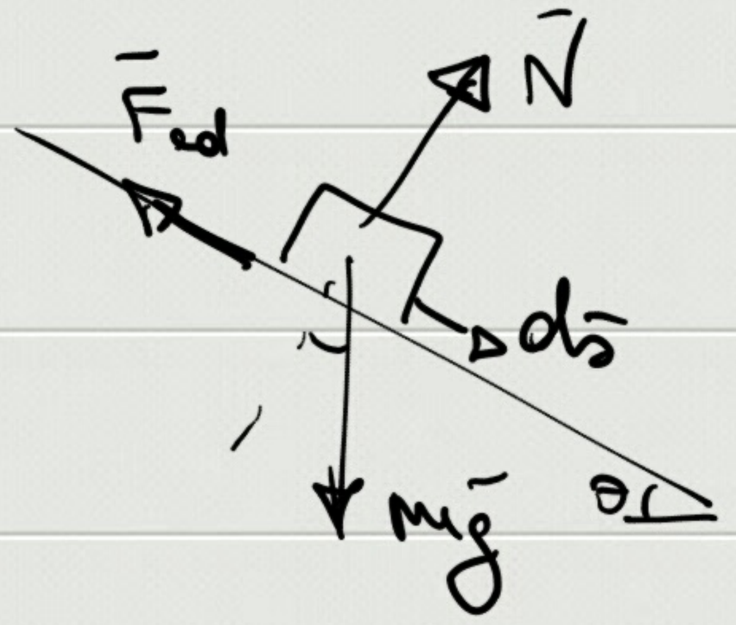




forze non cons. $\Rightarrow$ $\boxed{W_{nc} = \Delta E_m}$

$$E_{m,f} = E_{k,f} + E_{p,f} = \frac{1}{2} m v_f^2$$

$$E_{m,i} = mgh$$



$$W_{m,c} = \int_i^f \bar{F}_{ad}\, d\bar{s} =$$

$$= \int_i^f (-\mu_d N \bar{v}_v)\, d\bar{s} = -\mu_d mg\cos\theta \int_i^f ds =$$

$$= -\mu_d mg\cos\theta \cdot \ell = -\mu_d mg h \operatorname{ctg}\theta$$

$$-\mu_d \cancel{m} g h \operatorname{ctg}\theta = \frac{1}{2}\cancel{m} v_f^2 - \cancel{m} g h$$

$$\Rightarrow \quad v_f = \sqrt{2gh\,(1 - \mu_d \operatorname{ctg}\theta)}$$