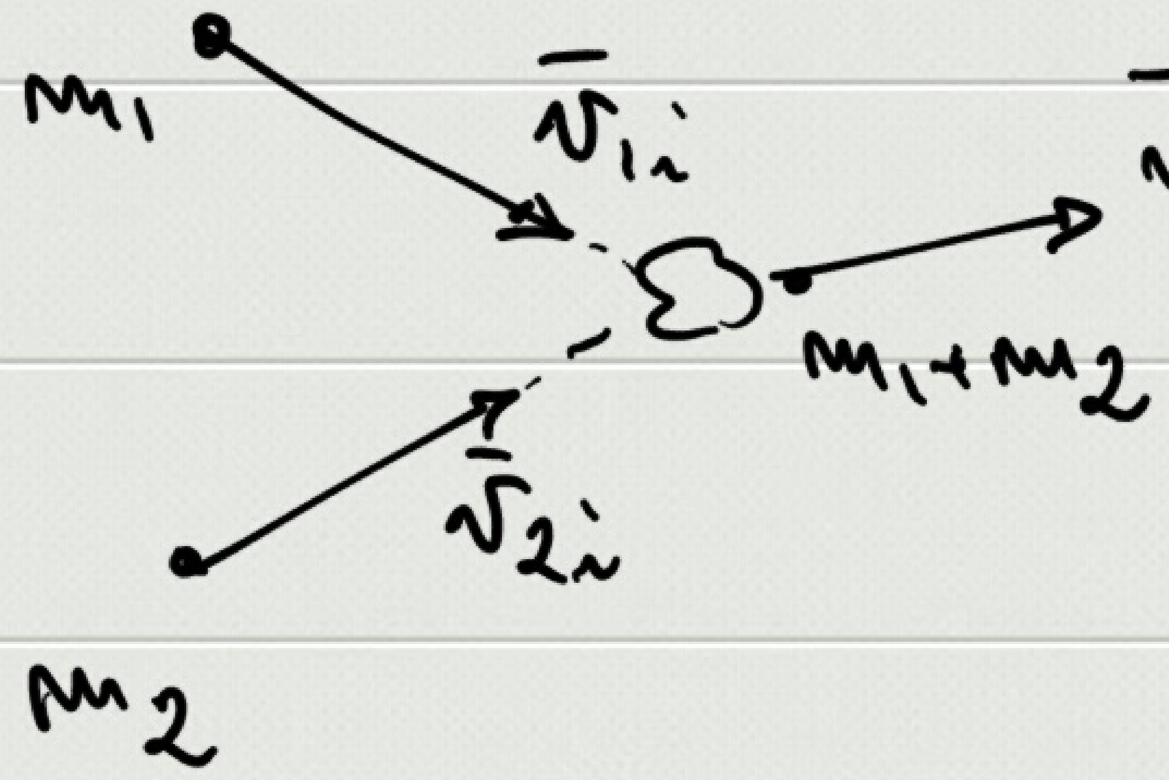
$\boxed{\bar{p} = cost}$ $\qquad E_k \neq cost$

Urto completamente anelastico



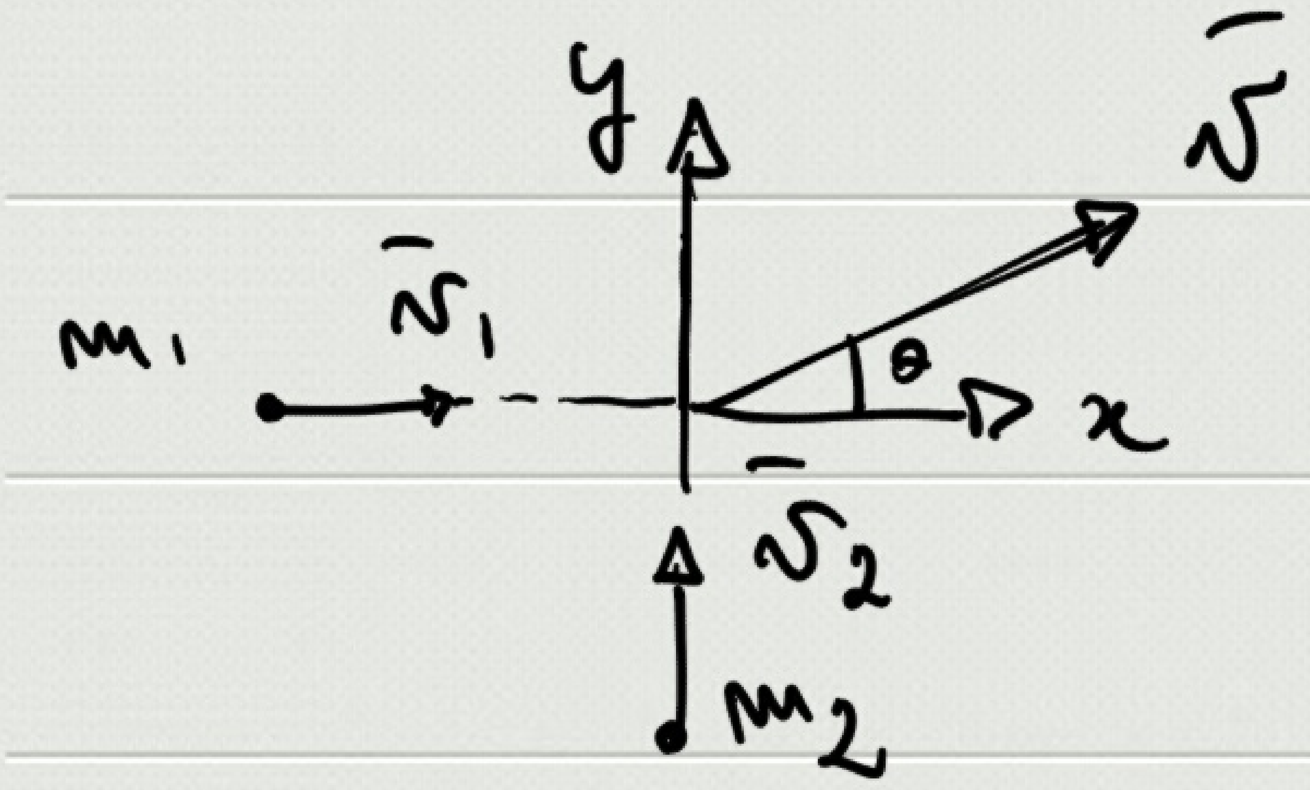

$$\bar{p} = m_1\bar{v}_{1i} + m_2\bar{v}_{2i} = \underset{\downarrow\, m_{TOT}}{(m_1+m_2)}\,\underset{\downarrow\, \bar{v}_{CM}}{\bar{v}} \qquad *$$

$$\stackrel{!}{=} m_{TOT}\,\bar{v}_{CM}$$

$$\Delta\bar{p}_1 = m_1\bar{v} - m_1\bar{v}_{1i} \stackrel{(*)}{\stackrel{!}{=}} -\left(m_2\bar{v} - m_2\bar{v}_{2i}\right) = -\Delta\bar{p}_2$$

$$\Delta E_k = E_{k,f} - E_{k,i} = \frac{1}{2}(m_1+m_2)v^2 +$$

$$- \left(\frac{1}{2}m_1 v_{1i}^2 + \frac{1}{2}m_2 v_{2i}^2\right)$$

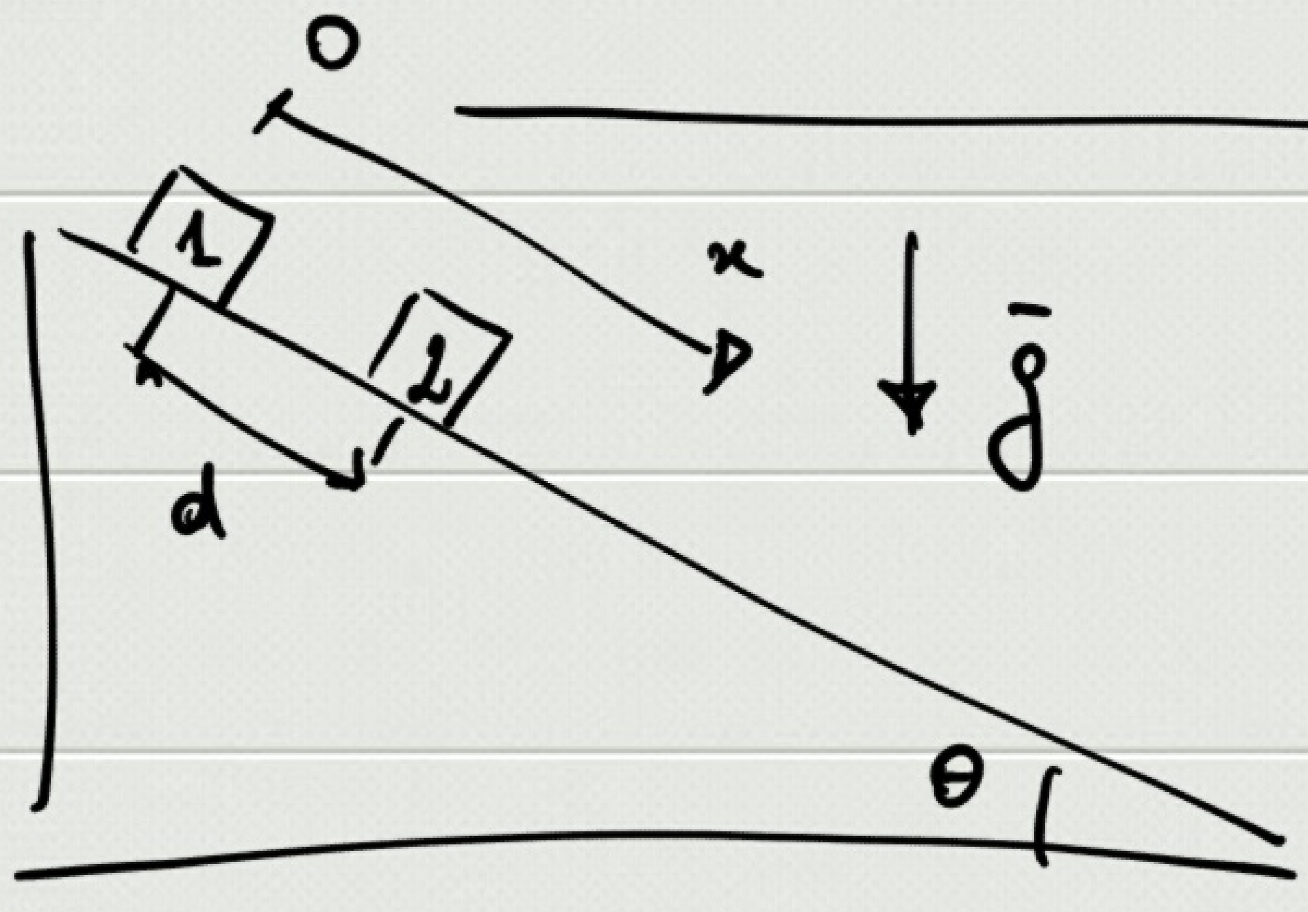



$$m_1 \bar{v}_1 + m_2 \bar{v}_2 = (m_1 + m_2)\, \bar{v}$$

$$\begin{cases} x: & m_1 v_1 = (m_1 + m_2)\, v \cos\theta \\ y: & m_2 v_2 = (m_1 + m_2)\, v \sin\theta \end{cases}$$

$$\operatorname{tg}\theta = \frac{m_2 v_2}{m_1 v_1} \qquad \Rightarrow \quad m_1^2 v_1^2 + m_2^2 v_2^2 = (m_1 + m_2)^2 v^2$$

$$\Rightarrow \quad v = \frac{\sqrt{m_1^2 v_1^2 + m_2^2 v_2^2}}{m_1 + m_2}$$




$v_{01} > v_{02}$

urto compl. anel

$v = ?$

$$\bar{P}_i = \bar{P}_f$$

$$\Rightarrow \bar{P}(t^{*-}) = \bar{P}(t^{*+})$$

$$a = g \sin\theta$$

$$1: \quad x_1(t) = v_{01} t + \frac{1}{2} a t^2$$

$$2: \quad x_2(t) = d + v_{02} t + \frac{1}{2} a t^2$$

$$x_1(t^*) = x_2(t^*) \quad \Rightarrow \quad v_{01} t^* + \cancel{\frac{1}{2} a t^{*2}} = d + v_{02} t^* + \cancel{\frac{1}{2} a t^{*2}}$$

$$t^* = \frac{d}{v_{01} - v_{02}}$$

$\bar{P}$ = costante $\Rightarrow$ $m_1 v_1(t^*) + m_2 v_2(t^*) = (m_1+m_2)\, v^*$

$v_1(t) = v_{01} + at$

$v_2(t) = v_{02} + at$

$$\Rightarrow m_1 v_{01} + m_1 a t^* + m_2 v_{02} + m_2 a t^* = (m_1+m_2)\, v^*$$

$$\Rightarrow v^* = \frac{m v_{01} + m_2 v_{02}}{m_1+m_2} + a t^* \overset{!}{=} v_{cM,0} + a t^*$$

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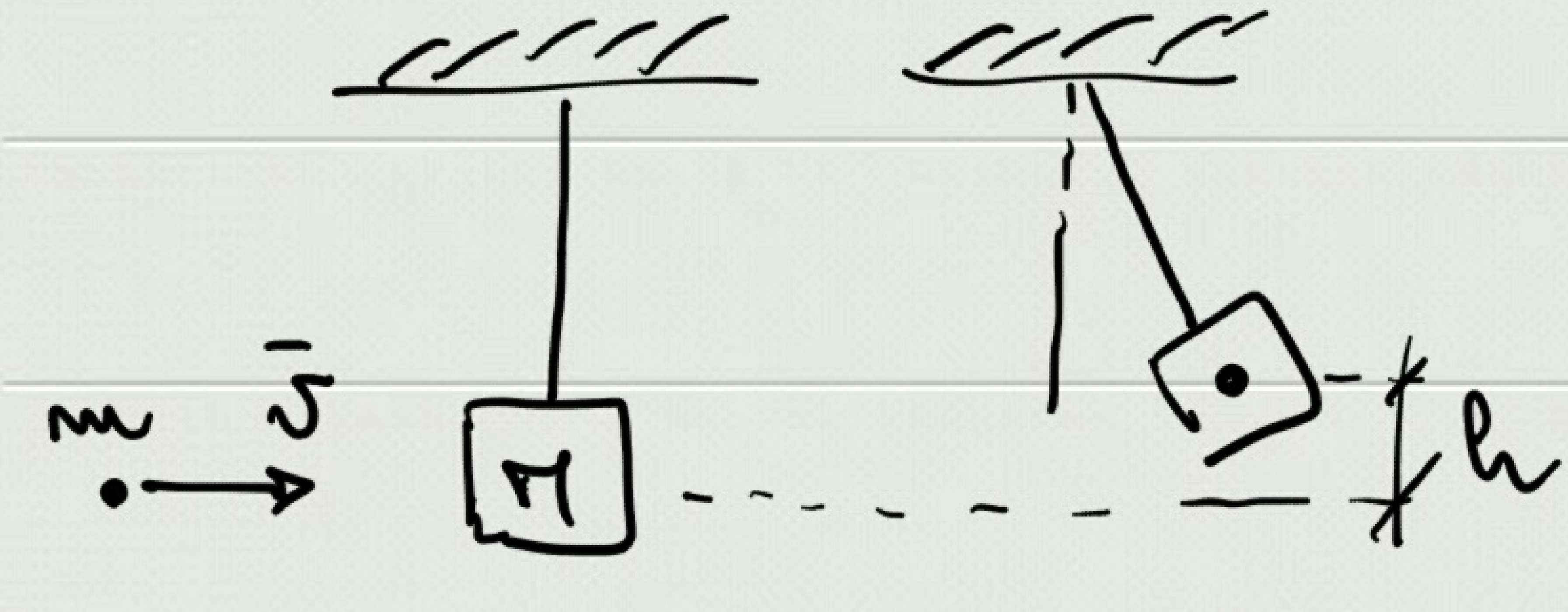
Pendolo balistico




$$m v = (m+M)\, V \Rightarrow V = \frac{m}{m+M}\, v$$

$$\frac{1}{2}\cancel{(m+M)}\, V^2 = \cancel{(m+M)}\, g h \Rightarrow \frac{m^2}{(m+M)^2}\, v^2 = 2 g h$$

$$\boxed{v = \frac{m+M}{m}\sqrt{2gh}}$$