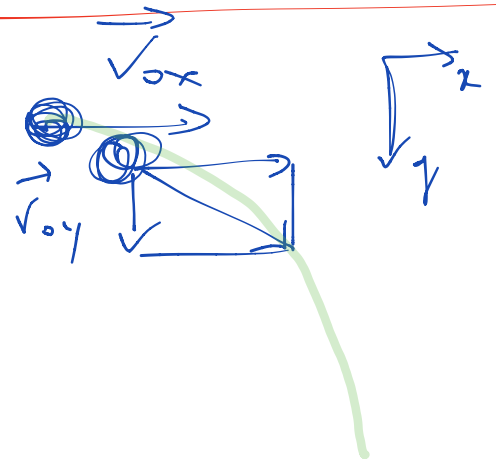
Lancio orizzontale



$$\begin{cases} x = v_{0x} t \\ y = \quad + \frac{1}{2} g t^2 \end{cases}$$

$$\begin{cases} v_{0x} = \text{costante} \\ v_{0y} = g t \end{cases}$$

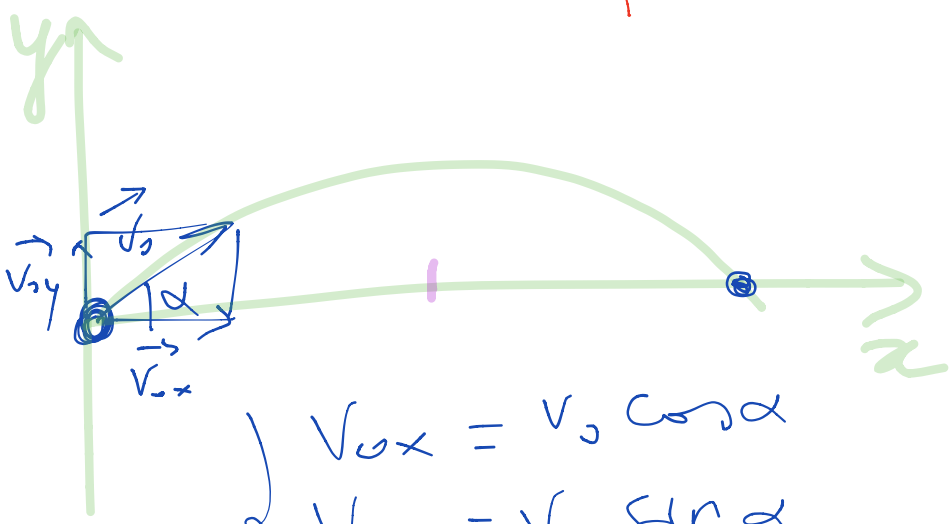
$$\begin{cases} t = \dfrac{x}{v_{0x}} \\ y = \quad + \dfrac{1}{2} g \dfrac{x^2}{v_{0x}^2} \end{cases}$$

$$y = \quad + \frac{g}{2 v_{0x}^2} x^2$$

$$y = a x^2$$

parabola

Lancio obliquo



$$\begin{cases} V_{0x} = V_0 \cos\alpha \\ V_{0y} = V_0 \sin\alpha \end{cases}$$

$$\begin{cases} x = V_{0x}\, t \\ y = V_{0y}\, t - \frac{1}{2} g t^2 \end{cases} \qquad \begin{cases} t = \dfrac{x}{V_{0x}} \\ y = \dfrac{V_{0y}}{V_{0x}} x - \dfrac{1}{2} g \dfrac{x^2}{V_{0x}^2} \end{cases}$$

$$\frac{V_{0y}}{V_{0x}} x - \frac{g}{2V_{0x}^2} x^2 = y$$

$$\begin{cases} y = ax^2 + bx \\ y = 0 \end{cases}$$

$$\frac{V_{oy}}{V_{ox}} x - \frac{g}{2V_{ox}^2} x^2 = 0$$

$$x\left(\frac{V_{oy}}{V_{ox}} - \frac{g}{2V_{ox}^2} x\right) = 0$$

$$x = 0 \qquad \frac{V_{oy}}{V_{ox}} = \frac{g}{2V_{ox}^2} x$$

$$x = \frac{V_{oy}}{\cancel{V_{ox}}} \cdot \frac{2V_{ox}^{\cancel{2}}}{g} = \frac{2V_{ox}V_{oy}}{g}$$

gittata

$$G = \frac{2V_0^2 \sin\alpha \cos\alpha}{g} = \frac{V_0^2 \sin 2\alpha}{g}$$

$$x_{max\ alt.} = \frac{G}{2} = \frac{V_{ox}V_{oy}}{g}$$

$$\cancel{V_y} = V_{oy} - gt \Rightarrow t = \frac{V_{oy}}{g}$$

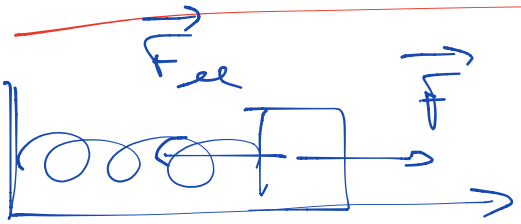
$$t_v = \frac{2V_{oy}}{g} \quad \text{tempo di volo}$$

$$h_{max} = V_{oy}\, t - \frac{1}{2} g t^2 =$$

$$= \frac{V_{oy} \cdot V_{oy}}{g} - \frac{1}{2} \cancel{g} \frac{V_{oy}^2}{g^{\cancel{2}}} =$$

$$= \frac{V_{oy}^2}{g} - \frac{1}{2} \frac{V_{oy}^2}{g} = \frac{V_{oy}^2}{2g}$$

Sistema masa-molle



$$\vec{F}_{el} = -K\vec{x}$$

$$-Kx = ma$$

$$a = -\frac{Kx}{m}$$

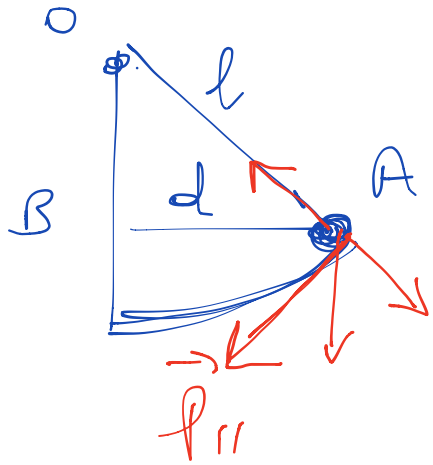
$$\frac{K}{m} = \omega^2$$

$$a = -\omega^2 x$$

$$\omega = \frac{2\pi}{T} = \sqrt{\frac{K}{m}}$$

$$\frac{T}{2\pi} = \sqrt{\frac{m}{K}} \Rightarrow T = 2\pi\sqrt{\frac{m}{K}}$$

Pendolo



$$P_{\parallel} = mg \sin\alpha = mg\frac{h}{l}$$

$$-\cancel{m}g\frac{d}{l} = \cancel{m}a$$

$$a = -\boxed{\frac{g}{l}}\, d \qquad \omega^2 = \frac{g}{l}$$

$$a = -\omega^2 d$$

$$\omega = \frac{2\pi}{T} = \sqrt{\frac{g}{l}} \Rightarrow T = 2\pi\sqrt{\frac{l}{g}}$$