Teorema Energia cinetica

$\vec{F} = m \cdot \vec{a} \to L = \vec{F} \cdot e \Rightarrow L = \int \vec{F}\, d\vec{e}$ ma $F = m \cdot \vec{a} \to L = \int m \cdot \vec{a}\, d\vec{e}$

ma $\vec{a} = \frac{d\vec{v}}{dt} \to L = m \int \frac{d\vec{v}}{dt} de$ $\vec{v}$ $\to L = m \int_{v_0}^{v_f} v\, dv = m \left(\frac{v_f^2}{2} - \frac{v_0^2}{2} \right)$

$\Rightarrow L = \int F \cdot de = G$

$\uparrow$ E cinetica

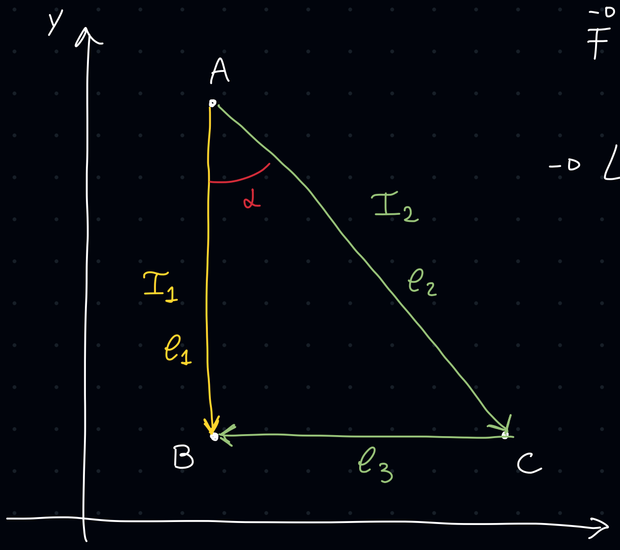
E potenziale : $U = -G \Rightarrow L = \int F \cdot de = -U$

$\Rightarrow dL = F \cdot de = -U$

Campo conservativo:

Quando il lavoro compiuto non dipende dal cammino ma solo da stato finale ed iniziale

Esempio : Campo gravitazionale con diversi cammini



$\vec{F} = \vec{P} = m \cdot \vec{g}$

$\to L_{I_1} = \int_A^B m\vec{g} \cdot d\vec{e}_1 = mg\,e_1$ $\to \overline{AB}$

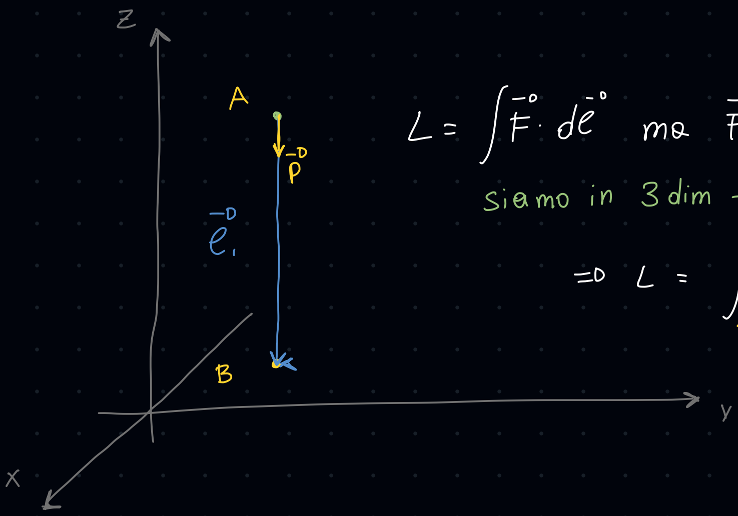
$L_{I_2} = \int_A^C m\vec{g} \cdot d\vec{e}_2 + \int_C^B m\vec{g} \cdot d\vec{e}_3$ $\hookrightarrow g \cdot de\,(\cos(\theta)) = \emptyset$ $\emptyset$

$= \int_A^C m\vec{g}\, d\vec{e}_2 = \int_A^C mg\,(de_2 \cos\alpha)$ $\hookrightarrow de_1$

$\Rightarrow \int_A^C mg\, de_1 = mg\,e_1$

QED

Energia potenziale



$L = \int \vec{F} \cdot d\vec{e}$ ma $\vec{F} = m\vec{g}$

siamo in 3 dim $\to \vec{F} = \vec{F}_x + \vec{F}_y + \vec{F}_z$

$\Rightarrow L = \cancel{\int \vec{F}_x\, d\vec{e}} + \cancel{\int \vec{F}_y\, d\vec{e}} + \int \vec{F}_z\, d\vec{e}$ ma F_y e $F_z = \emptyset$!

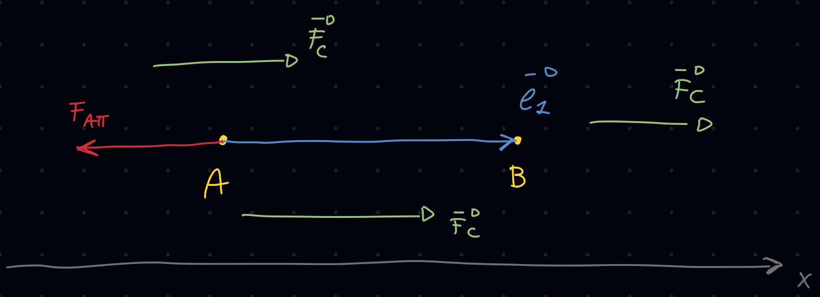
$\vec{P}$ ha verso opposto a $\vec{z}/\hat{k}$

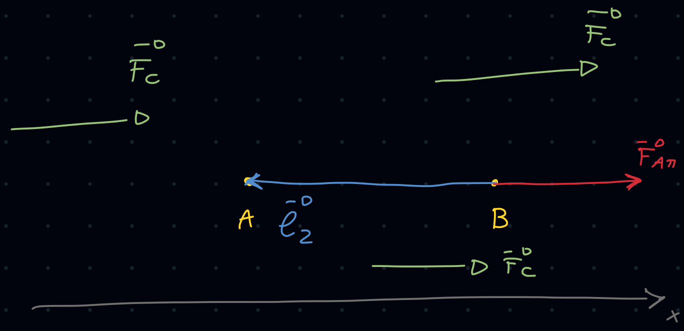
$\to L = -\int_{e_0}^{e_f} \vec{F}_z\, d\vec{e} = -mg \int_{e_0}^{e_f} de = -mg\,[e_f - e_0]$

Altezze !

$\Rightarrow L = mg\,h_0 - mg\,h_f$ Energia potenziale $U = -G$

Campo NON conservativo : Forza Attrito





$$L_1 = \int (\vec{F}_c - \vec{F}_{AT}) \cdot d\vec{e}_1 = (F_c - F_{AT}) \cdot e_1$$

$$L_2 = \int (-\vec{F}_c - \vec{F}_{AT}) \cdot d\vec{e}_2 = (-F_c - F_{AT}) \cdot e_2$$

$$L_1 + L_2 = (F_c - F_{AT})\, e_1 + (-F_c - F_{AT}) \cdot e_2$$

ma $|\vec{e}_1| = |\vec{e}_2|$

$$= F_c - F_{AT} - F_c - F_{AT} = -2\bar{F}_{AT}$$

Non conservativo