CONSERV. EN. MECC.

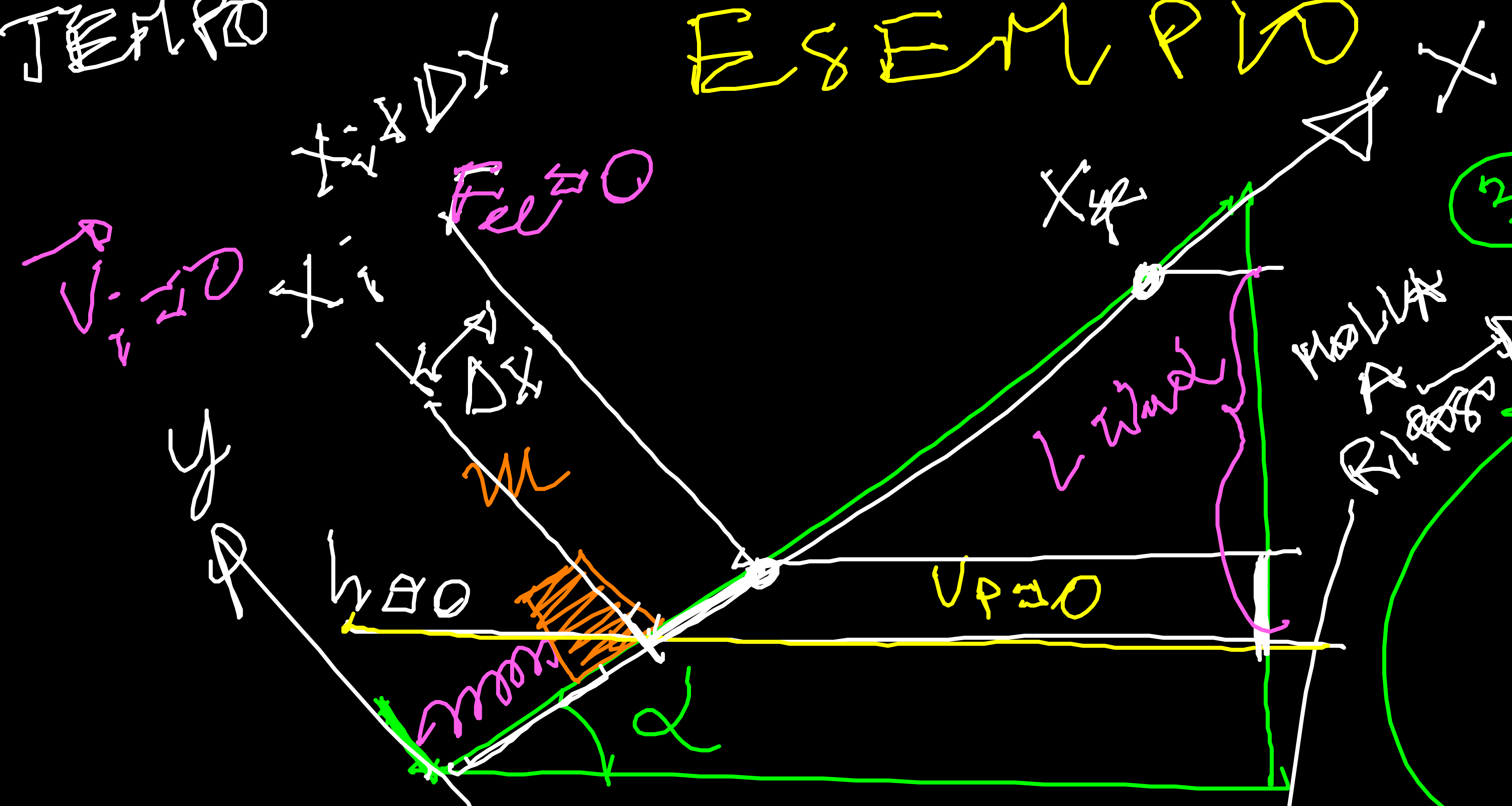
$COST. = E = K + U$ NEL TEMPO SE SOLO F CONS.

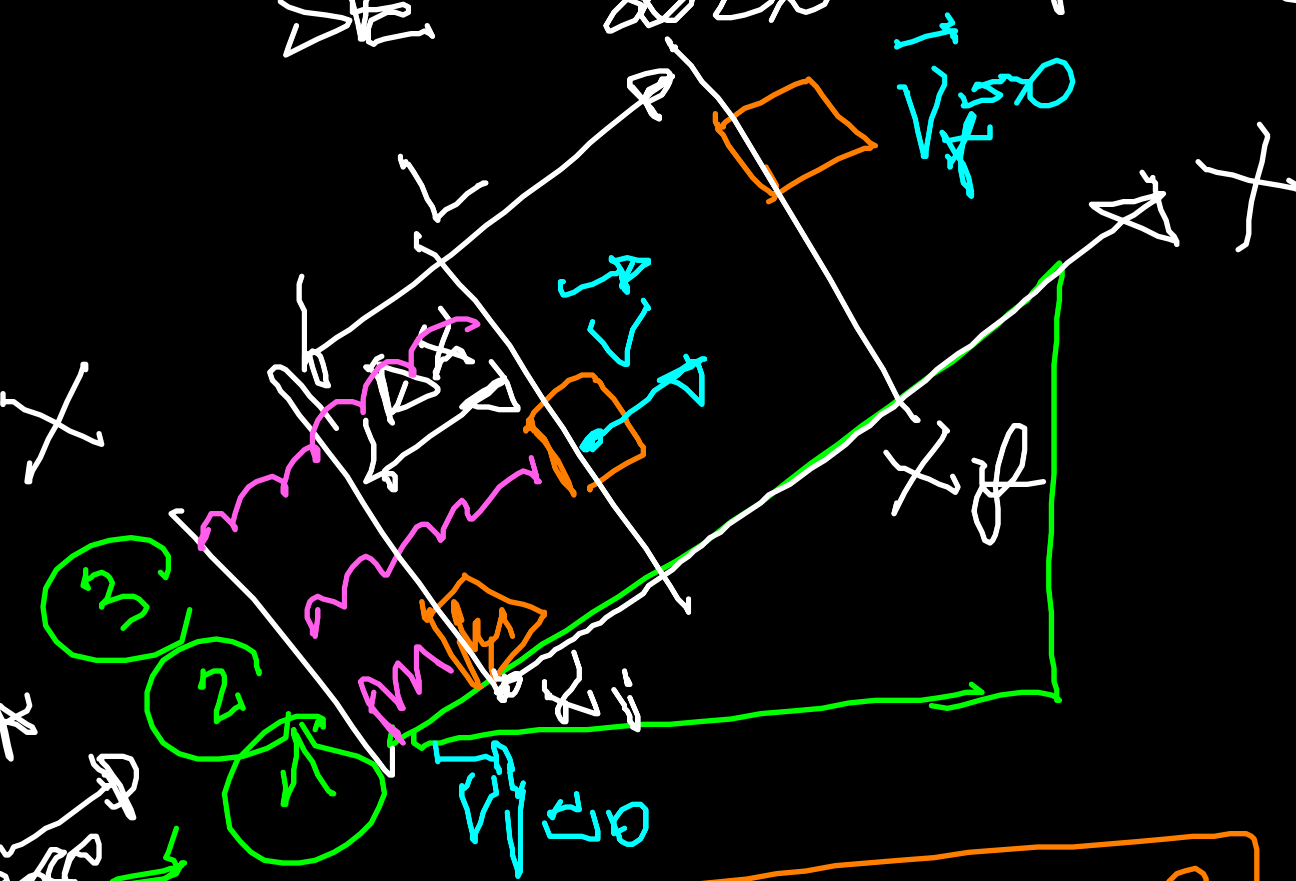
$\vec{F}_p \rightarrow \mathcal{L}_p \rightarrow U_p$

$\vec{F}_{el} \rightarrow \mathcal{L}_{el} \rightarrow U_{el}$

$\vec{N} \rightarrow \mathcal{L}_N = 0$

ESEMPIO





in X_i la molla è compressa di ΔX

$$\boxed{?\ L = X_f - X_i\ ?}$$

SUPPONENDO NO ATTR.

	x	K	U_p	U_{el}	= E = COST
1	X_i	0	0	$\frac{1}{2}k(\Delta X)^2$	$\frac{1}{2}k(\Delta X)^2$ =
2	$X_i + \Delta X$	$\frac{1}{2}mv^2$	$mg(\sin\alpha)\Delta X$	0	$\frac{1}{2}mv^2 + mg\Delta X \sin\alpha$ =
3	X_f	0	$mgL\sin\alpha$	0	$mgL\sin\alpha$

$$mgL\sin\alpha = \frac{1}{2}K(\Delta x)^2 \Rightarrow L = \frac{K(\Delta x)^2}{2g\sin\alpha}$$

$$\frac{1}{2}mv^2 + mg(\Delta x)\sin\alpha = \frac{1}{2}K(\Delta x)^2$$

$$v = \sqrt{-2g(\Delta x)\sin\alpha + \frac{K}{m}(\Delta x)^2}$$

$$\frac{K}{m}(\Delta x)^2 \geq 2g(\Delta x)\sin\alpha$$

PARTO DAL TEOREMA DELL'EN. CINETICA

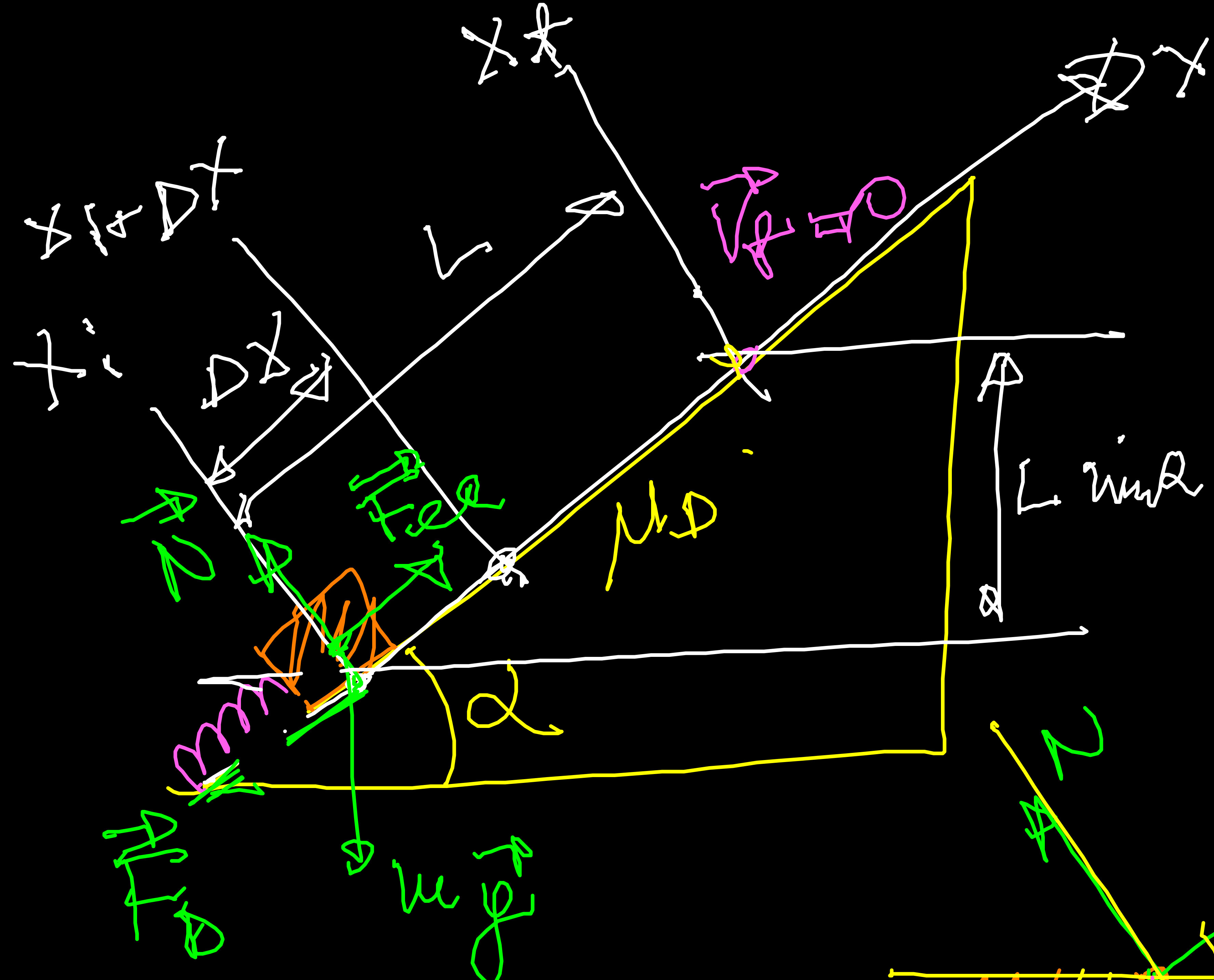
$$\Delta K = \mathcal{L}_{TOT} = \mathcal{L}_C + \mathcal{L}_{NC} = -(U_f - U_i) + \mathcal{L}_{NC}$$

$$K_f - K_i = -U_f + U_i + \mathcal{L}_{NC}$$

$$\underbrace{K_f + U_f}_{E_{m,f}} = \underbrace{K_i + U_i}_{E_{m,i}} + \mathcal{L}_{NC}$$

$$\boxed{E_{m,f} - E_{m,i} = \underline{\mathcal{L}_{NC}}}$$

Se $\mathcal{L}_{NC} = 0 \Rightarrow E_{m,f} = E_{m,i}$



CORPO MACROSCOPICO

$$\Delta K = \mathcal{L}_{TOT}$$

$$K_f - K_i = \underbrace{\mathcal{L}_p + \mathcal{L}_{el}}_{\mathcal{L}_c} + \underbrace{\mathcal{L}_{att}}_{\mathcal{L}_{NC}}$$

$$\boxed{0 = -mgL\sin\alpha + \frac{1}{2}K(\Delta x)^2 - \mu_D mg\cos\alpha\, L}$$

$\vec{V}_i = 0$

Δx

$$L = x_f - x_i$$
?

$$|\vec{F}_a| = \mu_D mg\cos\alpha$$

$$\mathcal{L}_p = -mg(y_f - y_i)$$

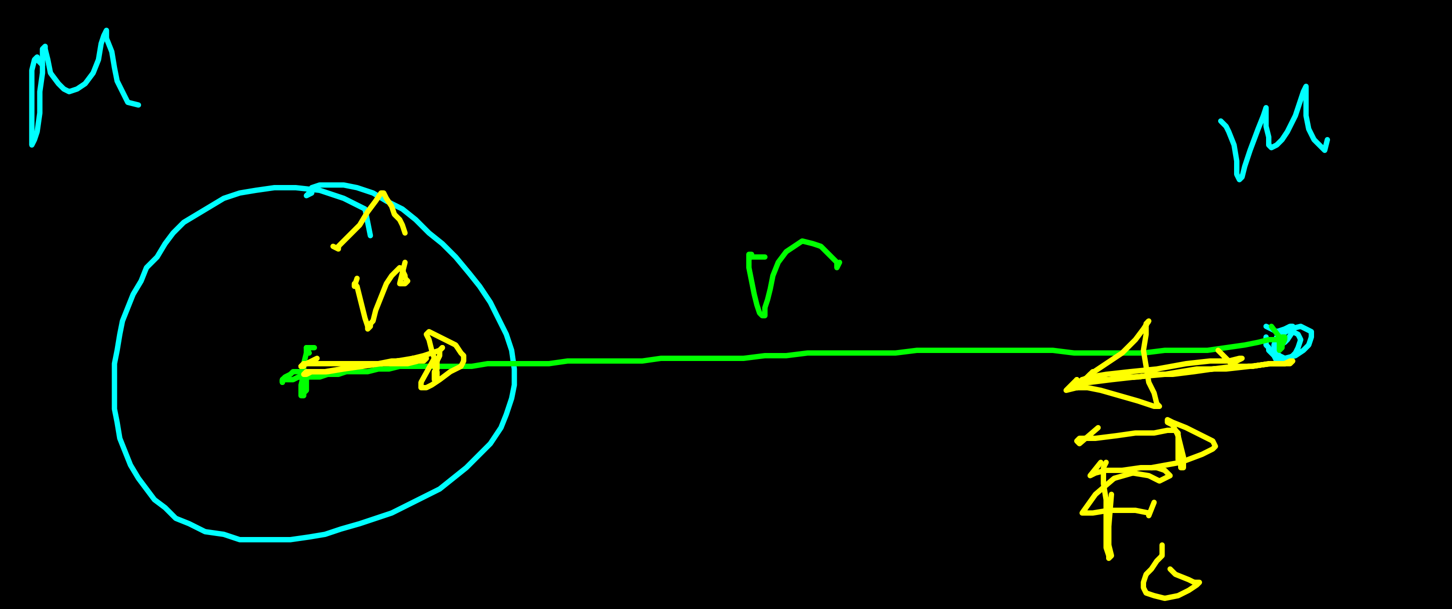
$$\mathcal{L}_{el} = \frac{K(\Delta x)^2}{2}$$

$$\frac{1}{2}K(\Delta x)^2 - mgL\sin\alpha = \mu_D mg\cos\alpha L$$

$$\underbrace{mgL\sin\alpha}_{E_{m,f}} - \underbrace{\frac{1}{2}K(\Delta x)^2}_{E_{m,i}} = \underbrace{-\mu_D mg\cos\alpha L}_{\mathcal{L}_{NC}} < 0$$

$$E_{m,f} = E_{m,i} + \mathcal{L}_{NC} < 0$$

ENERGIA POT. DELLA FORZA DI GRAVITÀ

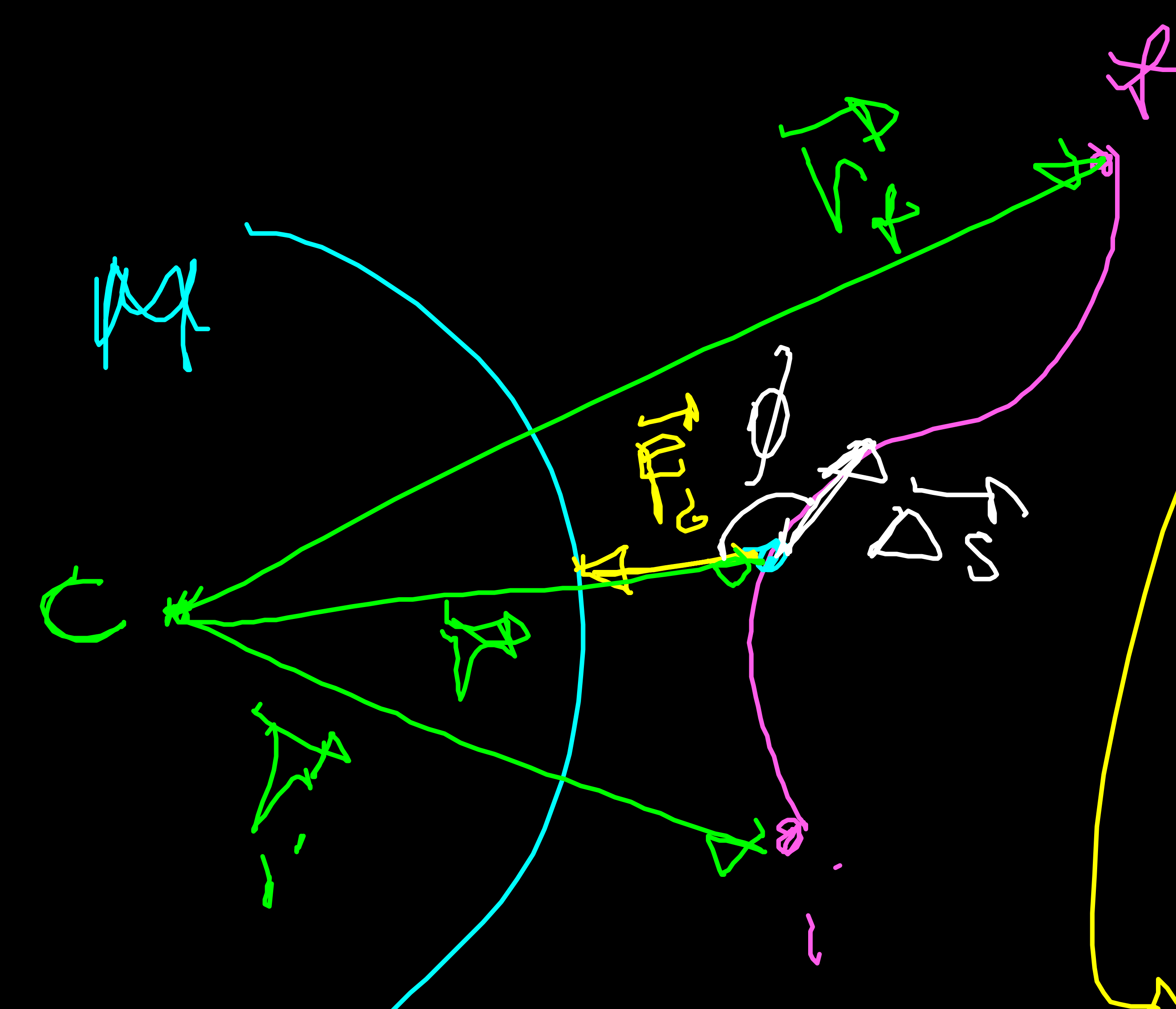


$$\vec F_G = -G\frac{Mm}{r^2}\hat r$$

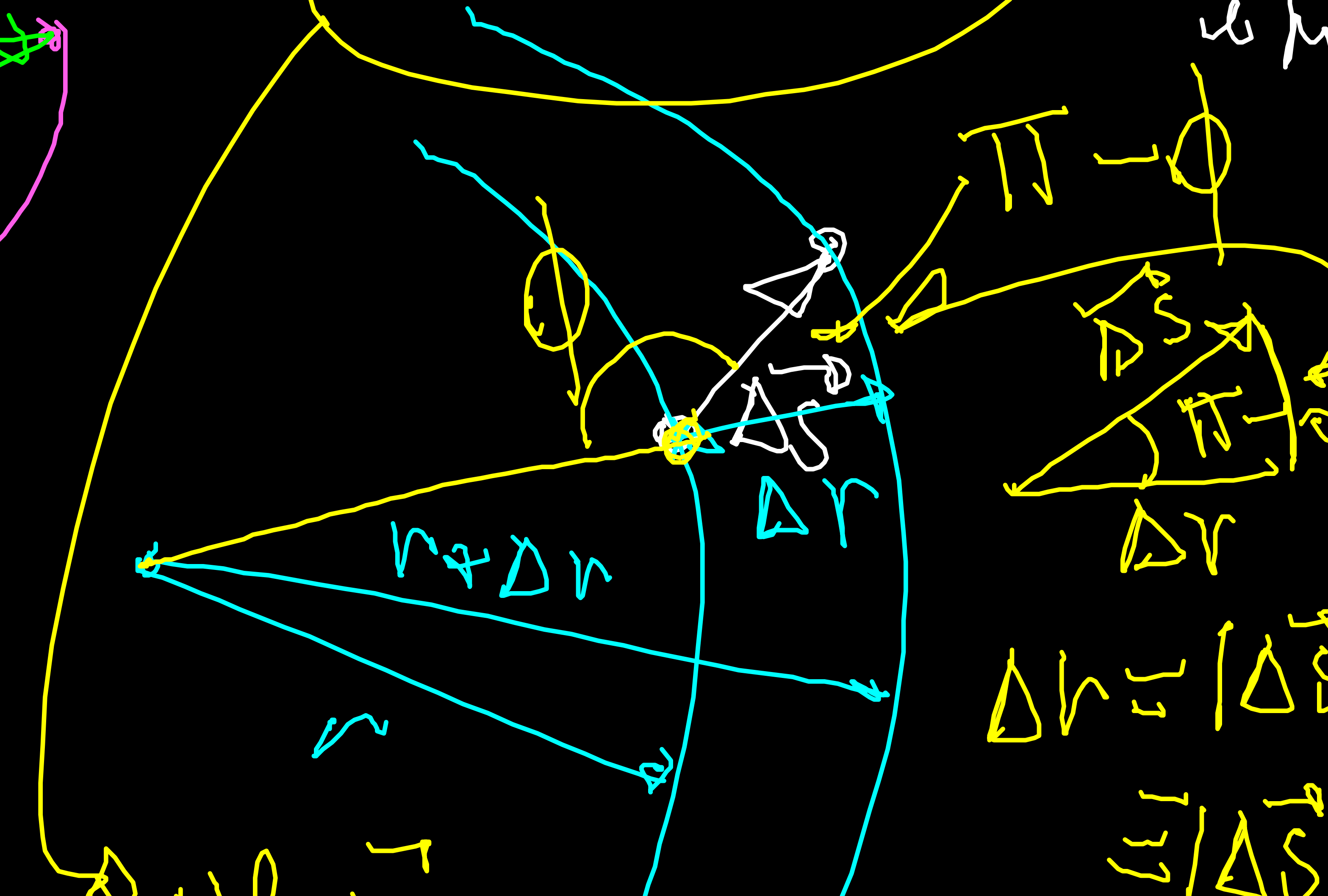
$$F_G = G\frac{Mm}{r^2}$$

Se $\int_i^f \vec F_G \cdot d\vec r = \mathcal{L}_{i\to f}$ non dipende dal percorso

$\Rightarrow \vec F_G$ è conservativa



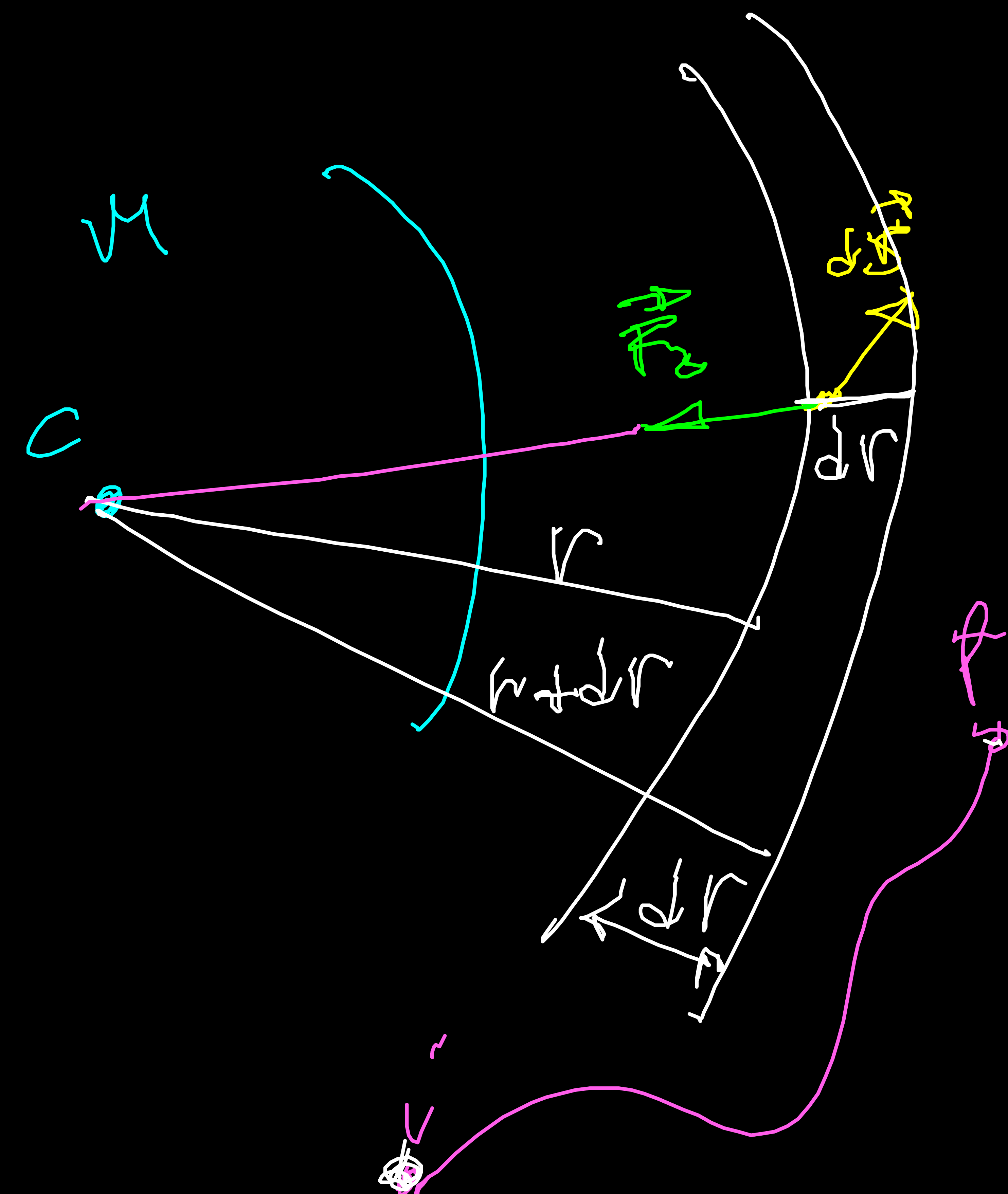
$\Delta\mathcal{L} = \vec F \cdot \Delta\vec s$ se $\Delta\vec s$ è piccolo



$\Delta r = |\Delta\vec s|\cos(\pi-\phi)$

$= -|\Delta\vec s|\cos\phi$

$\Delta\mathcal{L} = |\vec F_G||\Delta\vec s|\cos\phi = -\Delta r\,|\vec F_G|$



$$\vec{F}_G \cdot d\vec{s} = -|\vec{F}_G|\,dr$$

$$\mathcal{L}_{i\to f} = \int_{r_i}^{r_f} -|\vec{F}_G|\,dr = \int_{r_i}^{r_f} -\frac{GMm}{r^2}\,dr$$

$\vec{F}_G$ é CONS.

$\mathcal{L}_{i-}$