TEOREMA DELL'ENERGIA CINETICA

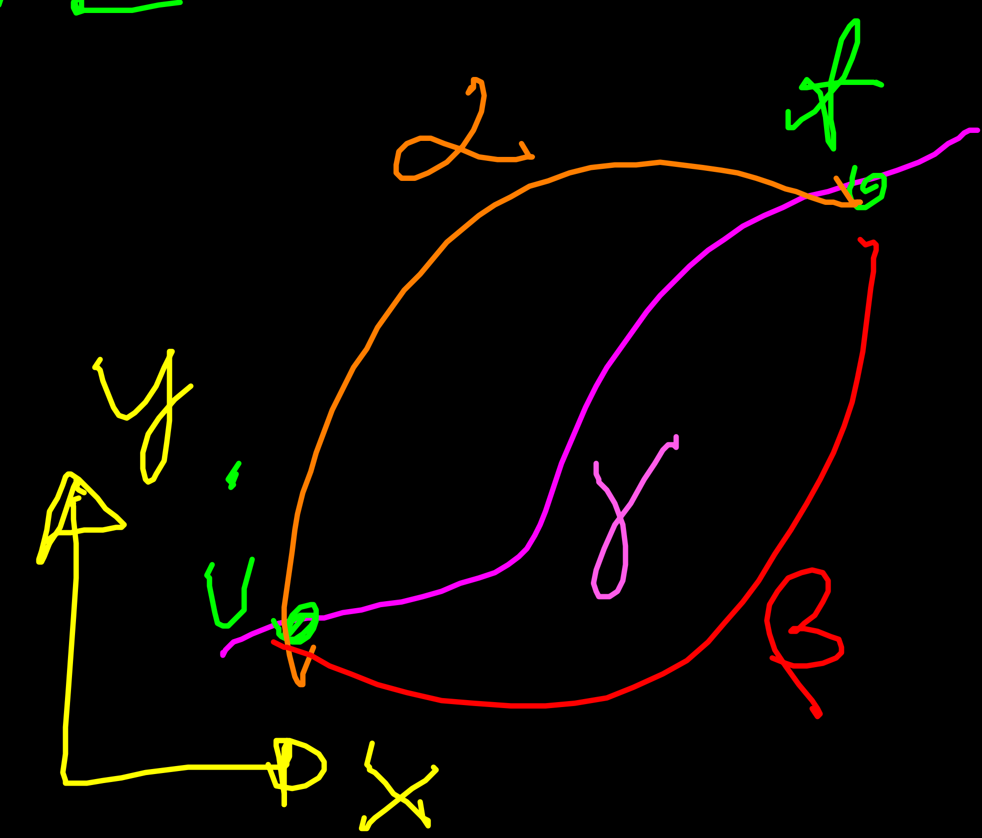
$$\mathcal{L}_{TOT} = \Delta K$$ (SIST. DI RIF. INERZIALE)

PRINCIPIO DI CONSERV. DELL'ENERGIA

Il **SISTEMA** **NON** INTERAGISCE CON IL **RESTO DELL'UNIV.** $\Rightarrow$ E è COSTANTE NEL TEMPO (CONSERVATA)

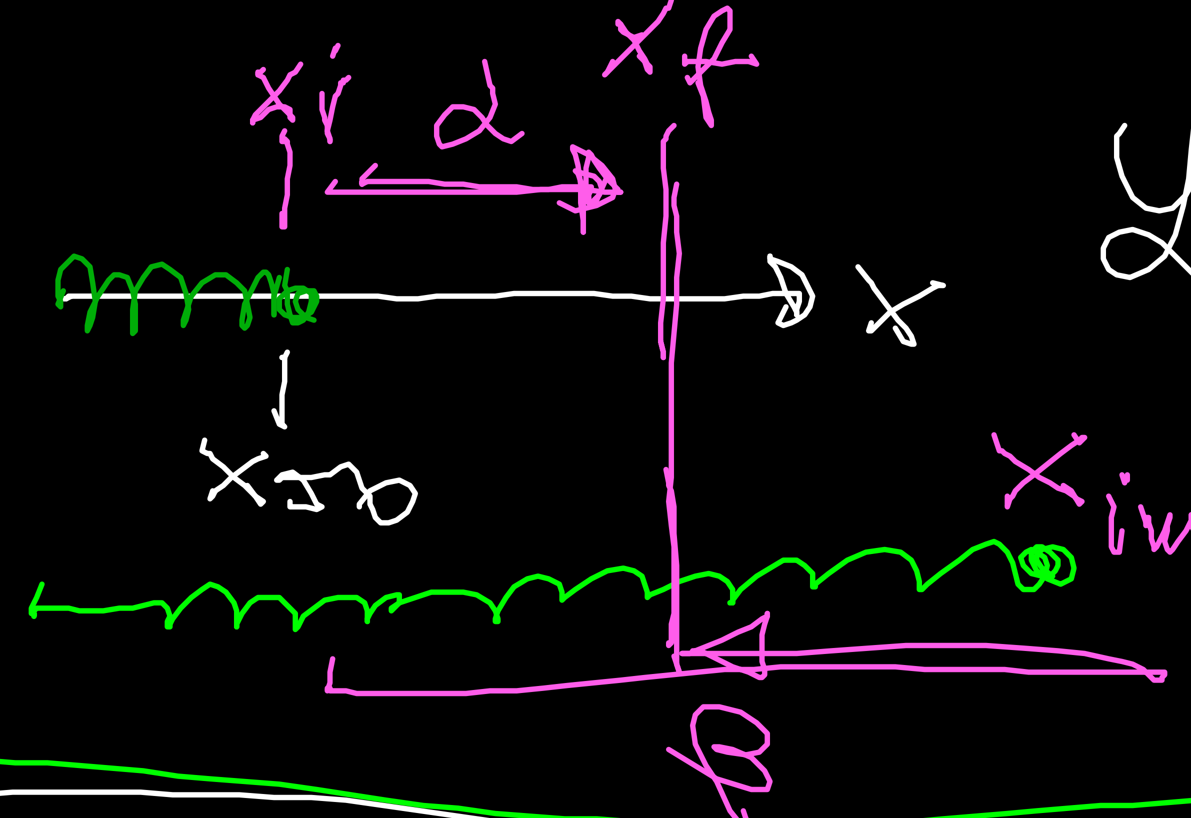
FORZE CONSERVATIVE

FORZA PESO



$$\mathcal{L}_{P} = -mg\,(y_f - y_i) \quad \forall\, \alpha, \beta, \gamma \ldots$$

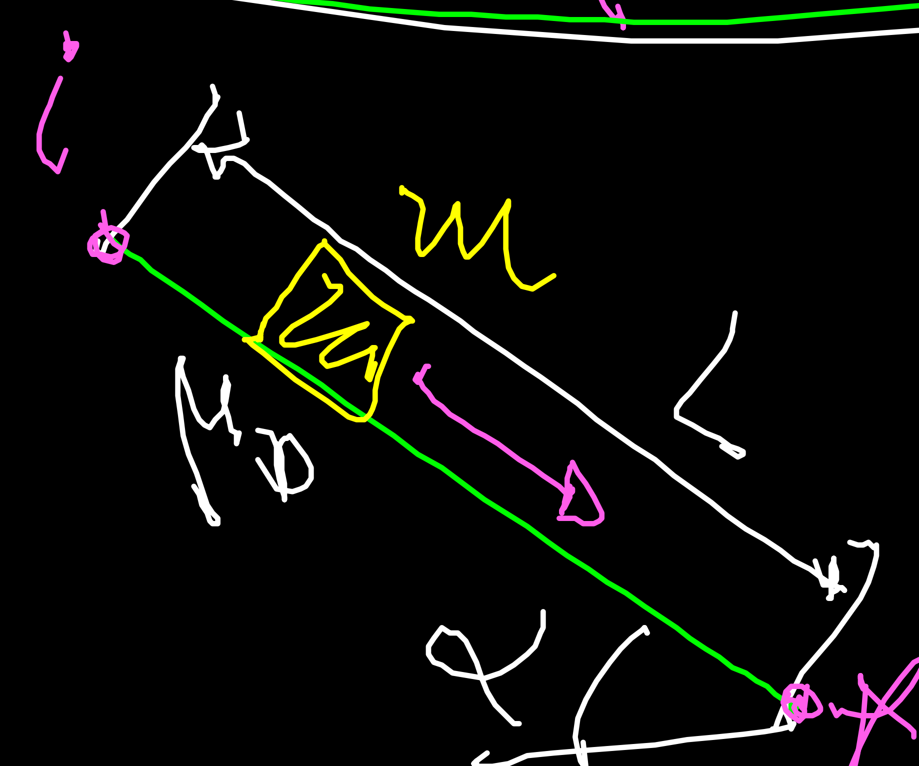
FORZA ELAST.



$$\mathcal{L}_{Fel} = -\frac{K}{2}\left(x_f^2 - x_i^2\right) \quad \forall\, \alpha, \beta$$

FORZE NON CONS.

FORZA DI ATTRITO



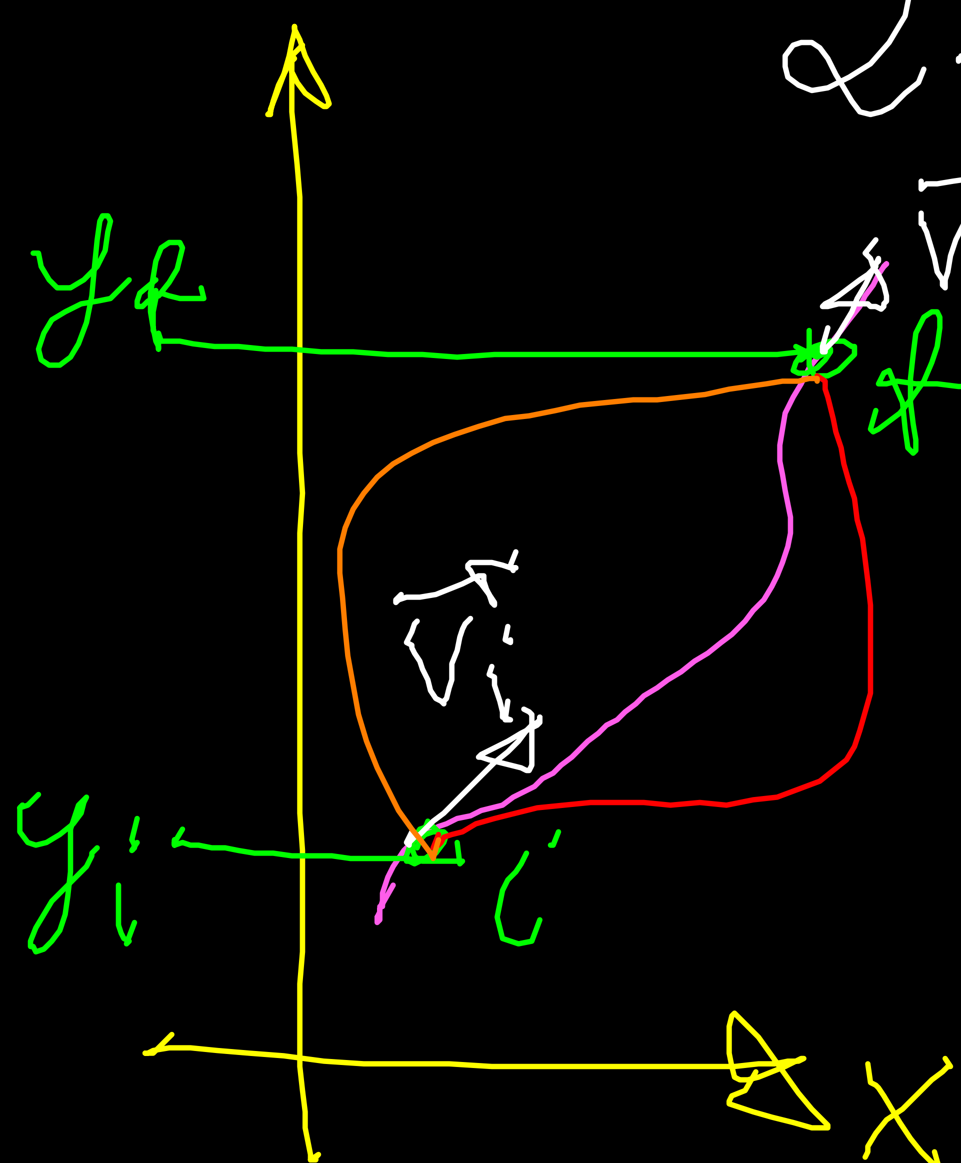
$$\mathcal{L}_{att} = -(\mu_D\, m g \cos\alpha) \cdot L$$

$$\mathcal{L}_{L} \neq \mathcal{L}_{L_1}$$

IPOTESI — SOLO FORZE CONS.

ES. PESO

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



$$\mathcal{L}_{PESO} = \underbrace{-mg(y_f - y_i) = \frac{m}{2}(v_f^2 - v_i^2)}$$

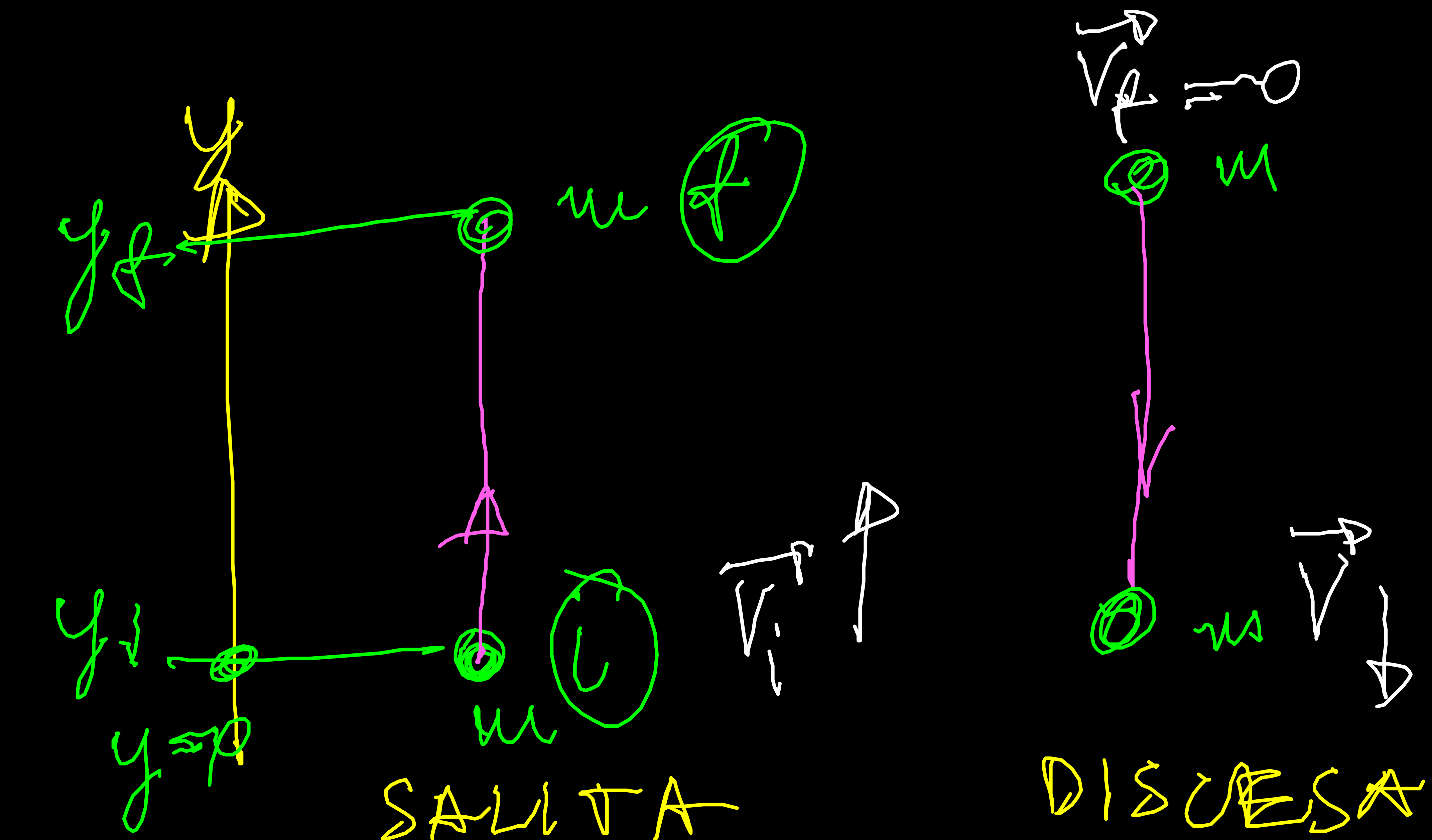
$$E = \underbrace{\overbrace{\frac{m}{2}v_f^2}^{K} + \overbrace{mgy_f}^{U}}_{f} = \underbrace{\frac{m}{2}v_i^2 + mgy_i}_{i}$$

ENERGIA MECCANICA

$$E = K + U$$

$$E_f = E_i$$

$$K_f + U_f = K_i + U_i$$



$$E = K + U = \text{cost.}$$

$$i \to f \qquad E_f = E_i$$

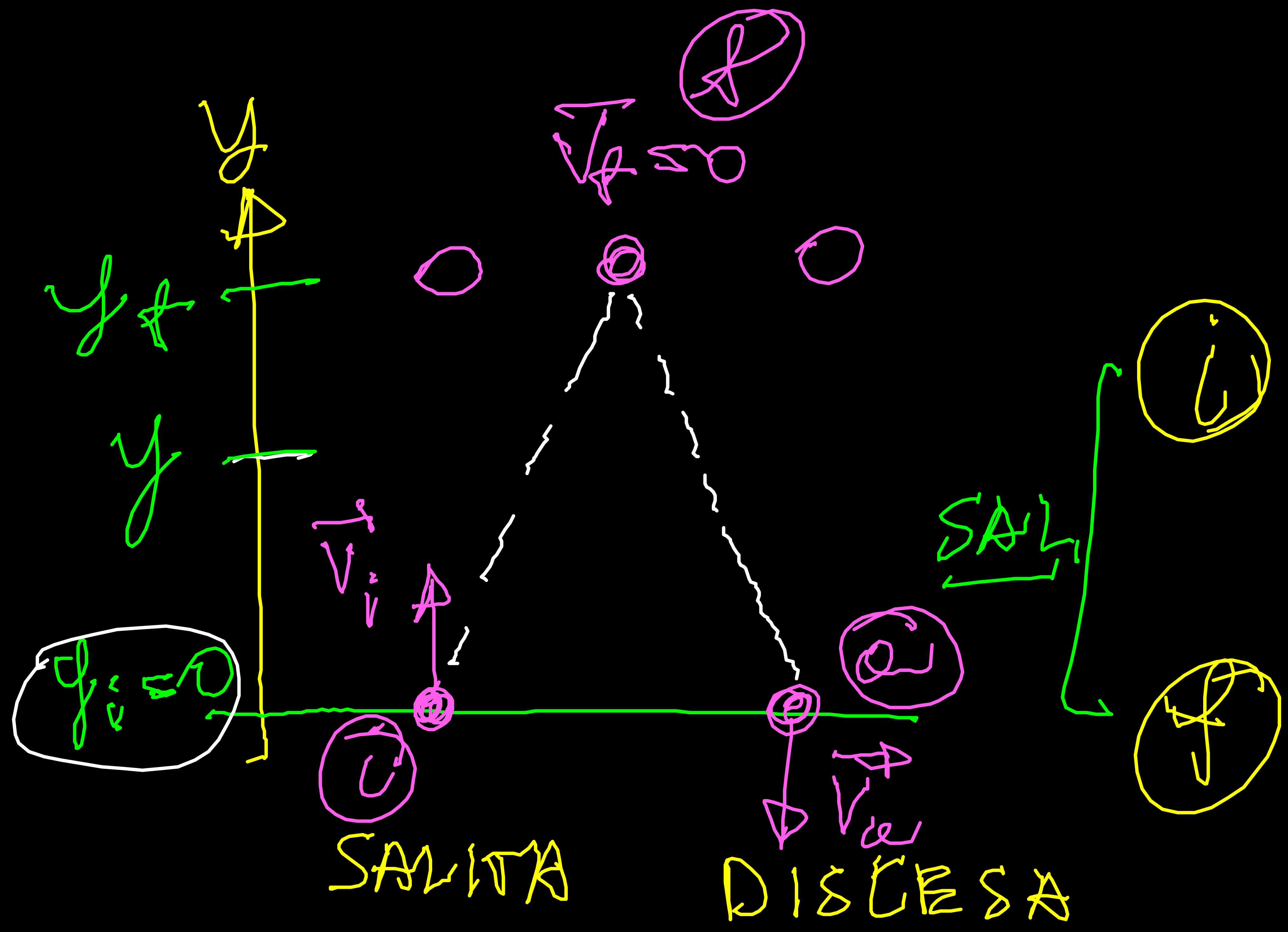
$$K_f + U_f = K_i + U_i$$

$$U_f = \frac{1}{2} m V_i^2 + U_i$$

$$U_f - U_i = \frac{1}{2} m V_i^2$$

	K	U
y_f	0	
$y_i = 0$, $V_i \neq 0$	$\frac{1}{2} m V_i^2$	

$$\boxed{\frac{1}{2} m v_f^2 + m g y_f = \frac{1}{2} m V_i^2 + m g y_i}$$



y	K CINETICA	U POTENZIALE	E = K + U
0	$\frac{1}{2} m v_i^2$	0 AUM	$\frac{1}{2} m v_i^2$
y	$\frac{1}{2} m v_y^2$	mgy	$\frac{1}{2} m v_y^2 + mgy$
y_f	0 DIM	mgy_f	mgy_f
0	$\frac{1}{2} m v_a^2$	0	$\frac{1}{2} m v_a^2$

FORZA PESO

$$\underbrace{\frac{1}{2} m v_f^2}_{K_f} + \underbrace{mgy_f}_{U_f} = \underbrace{\frac{1}{2} m v_i^2}_{K_i} + \underbrace{mgy_i}_{U_i}$$

$$\boxed{E = K_f + U_f = K_i + U_i = \text{cost.}}$$

$$\frac{1}{2} m v_i^2 = \frac{1}{2} m v_y^2 + mgy =$$
$$= mgy_f = \frac{1}{2} m v_a^2$$

$$\underbrace{\mathcal{L}_{TOT}} = \overbrace{\underbrace{K_f - K_i}}^{\Delta K} = -(U_f - U_i) = -\Delta U$$

$$\boxed{K_f + U_f = K_i + U_i}$$

SOLO $F_x(x)$ CONSERV.

CASO UNIDIM.

$$\mathcal{L}_F = \int_{x_i}^{x_f} F_x(x)\,dx = -(U_f - U_i)$$

U = EN. POT. DI F_x (CONS.)

DIPENDE SOLO DALLE COORDINATE

EN. POT. DEL PESO

$$\int_{y_i}^{y_f} F_y(y)\,dy = -mg(y_f - y_i) = -(U_f - U_i)$$

DEF. DE EN. POT. (DEL PESO)

$$U_f - U_i = \Delta U = mg(y_f - y_i)$$

$y = h$ — mgh

$\Delta U = mgh$

$U(h) = 0$

$\Delta U = U_f - U_i$
$= mgh$

0 — $U_f = -mgh$

$U(0) = 0$

$-mgh = -(U_f - U_i)$

$y = 0$ — 0

0

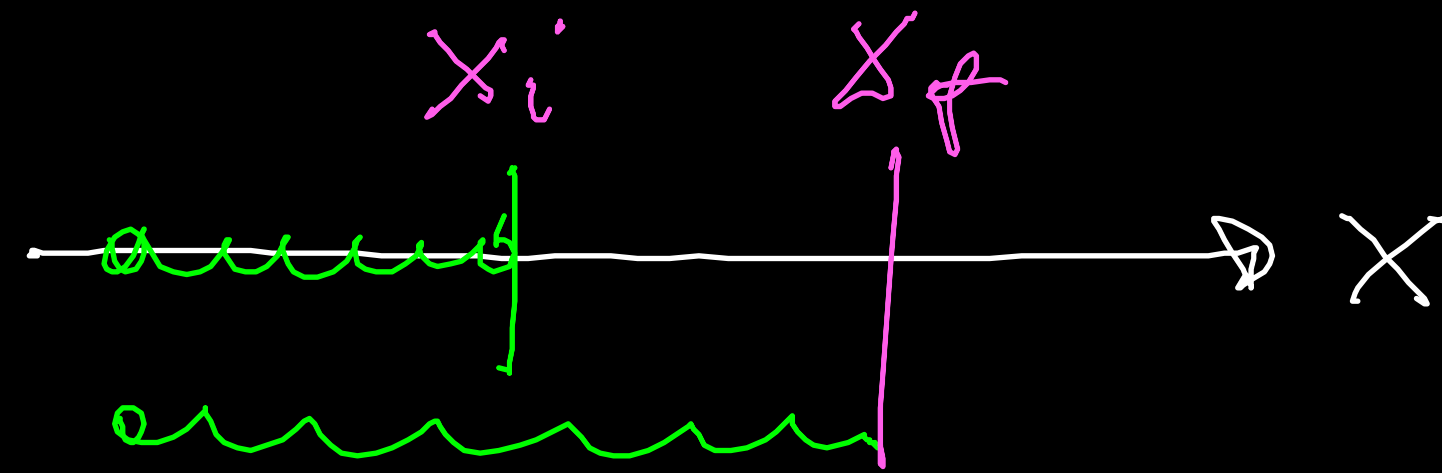
$U_i = -mgh$

$U(0) = 0$

↑DEF

$U(h) = 0$

EN. POT. FORZA EL.



$$F_{el} = -kx$$

$$\mathcal{L}_{F_{el}} = \int_{x_i}^{x_f} -kx\,dx = -\frac{k}{2}\left(x_f^2 - x_i^2\right)$$

$$U_{f,el} - U_{i,el} = \frac{k}{2}\left(x_f^2 - x_i^2\right)$$

PONGO $U_{el}(0) = 0 \Rightarrow \boxed{U_{el} = \frac{1}{2}kx^2}$

(MOLLA A RIPOSO)