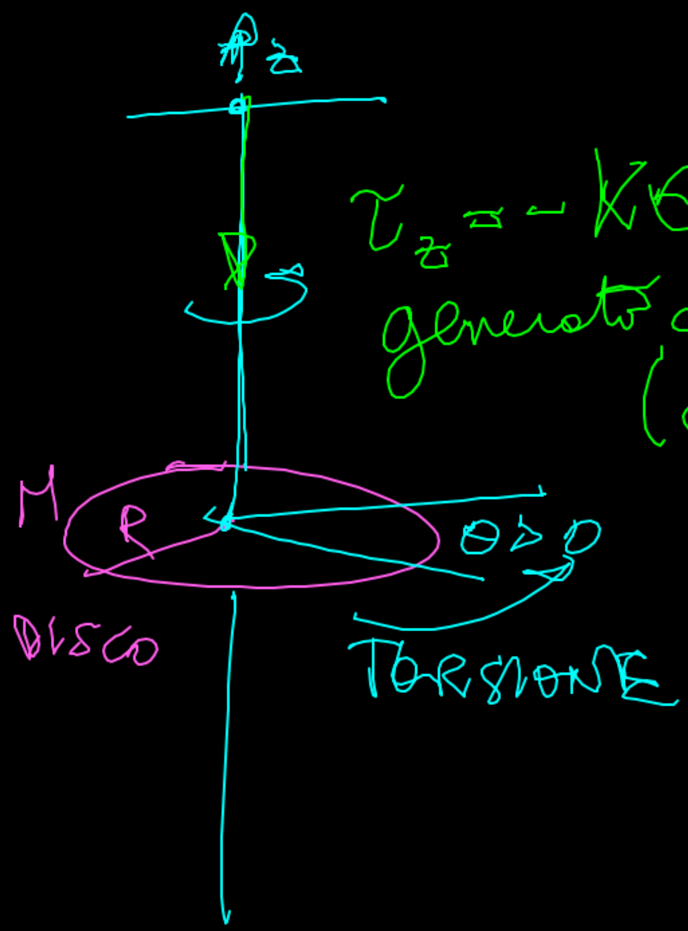
PENDOLO DI TORSIONE



$\tau_z = -K\theta$
generato dal filo
(di acciaio)

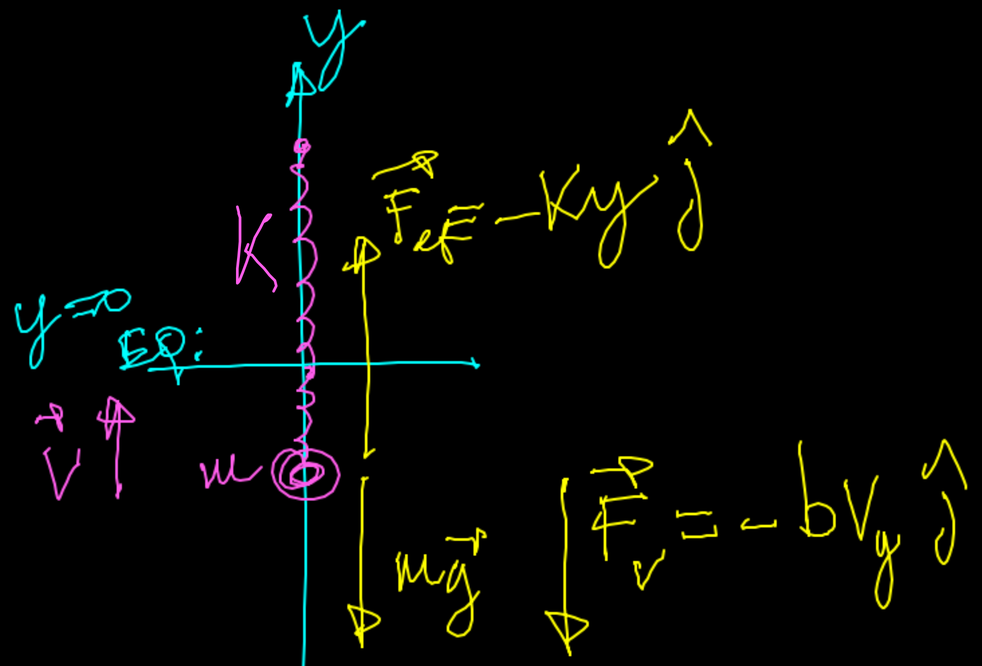
$$\tau_z = I_z \alpha = I_z \ddot{\theta}$$

$$-K\theta = \frac{1}{2} M R^2 \ddot{\theta}$$

$$\ddot{\theta} = -\frac{2K}{MR^2}\theta$$

$$\omega_{PT} = \sqrt{\frac{2K}{MR^2}}$$

OSCILLAZIONI SMORZATE



ATTRITO VISCOSO
PROP. ALLA $\vec{V}$

$$m a_y = -ky - b\frac{dy}{dt}$$

$$\ddot{y} = -\frac{K}{m}y - \frac{b}{m}\dot{y}$$

$$\ddot{y} + \frac{b}{m}\dot{y} + \frac{K}{m}y = 0$$

$$\ddot{y} + \gamma\dot{y} + \omega^2 y = 0$$

$$\gamma = \frac{b}{m} \qquad \omega = \sqrt{\frac{K}{m}}$$

OSC. SMORZATO

$$\ddot{y} + \gamma \dot{y} + w^2 y = 0$$

$\gamma = \frac{b}{m}$

$w = \sqrt{\frac{K}{m}}$

OSC. SMORZATO

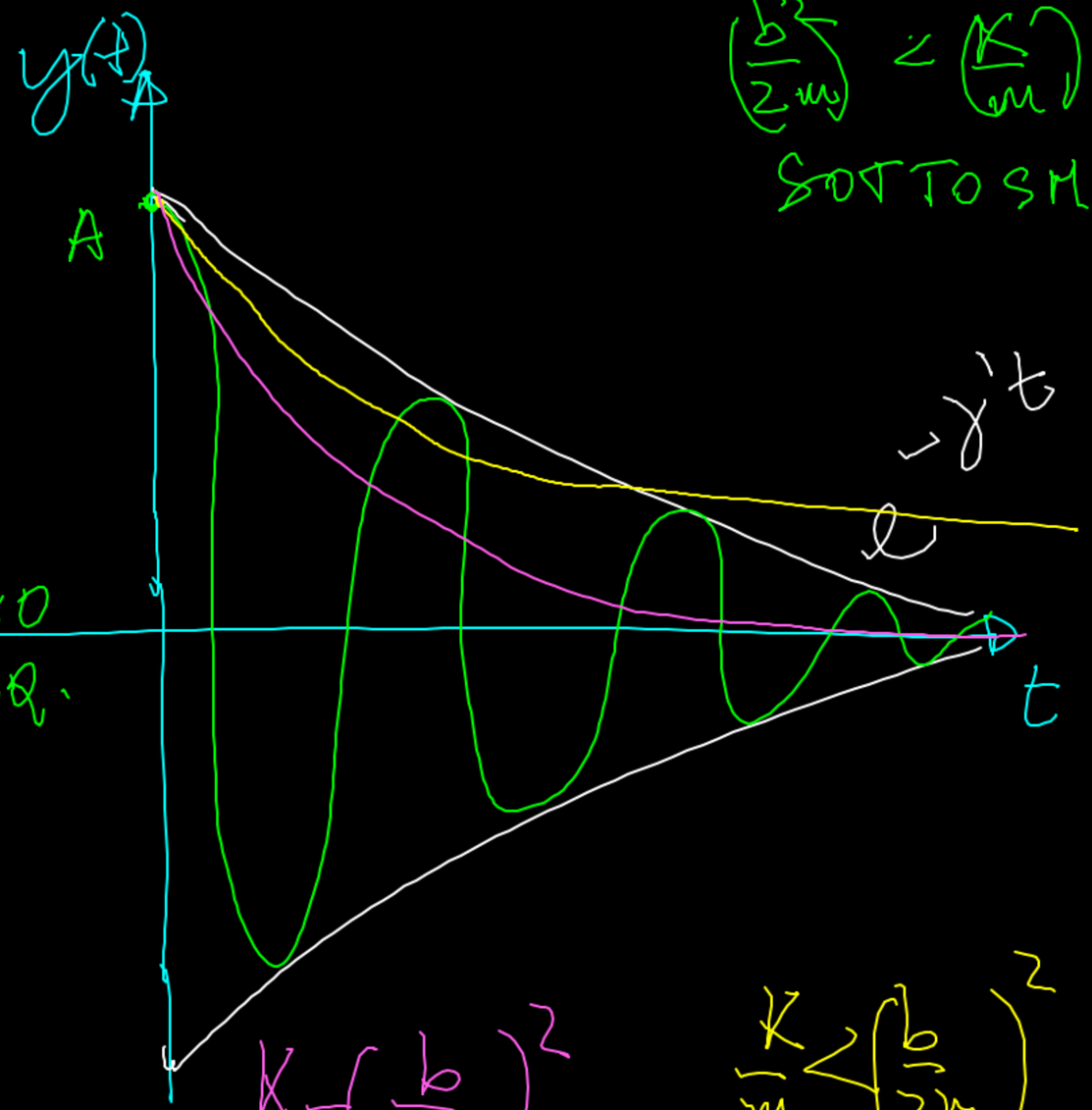
$$y(t) = \underbrace{e^{-\gamma' t} A \cos(w_s t + \phi)}_{\text{ampiezza}}$$

EQ.

$$\gamma' = \frac{\gamma}{2} = \frac{b}{2m}$$

$$w_s = \sqrt{\frac{K}{m} - \left(\frac{b}{2m}\right)^2} = \sqrt{w^2 - \gamma'^2}$$

"pulsazione"



$\left(\frac{b}{2m}\right)^2 < \left(\frac{K}{m}\right)$

SOTTOSM.

$\frac{K}{m} = \left(\frac{b}{2m}\right)^2$

SMORZ. CRITICO

$\frac{K}{m} < \left(\frac{b}{2m}\right)^2$

SOVRASM.

OSCILLAZIONI FORZATE

$$\ddot{y} + \frac{b}{m}\dot{y} + \frac{K}{m}y = 0$$

OSC. SMORZATE

$$m\ddot{y} = -b\dot{y} - Ky + F_0\cos(\omega_E t)$$

- $m\ddot{y}$: ma_y
- $-b\dot{y}$: effetto usuale di "richiamo"
- $-Ky$: forza di "richiamo"
- $F_0\cos(\omega_E t)$: termine "forzante"

$$\ddot{y} + \gamma\dot{y} + \omega^2 y = \left(\frac{F_0}{m}\right)\cos(\omega_E t)$$

$y(t) =$ "TRANSIENTE" + "SOLUZ. STAZIONARIA"

per $t \to \infty$ $\quad y(t) \cong$ "SOL. STAZ."

OSC. FORZATE — SOL. STAZIONARIA

$$\ddot{y} + \gamma \dot{y} + \omega^2 y = \left(\frac{F_0}{m}\right) \cos(\omega_E t)$$

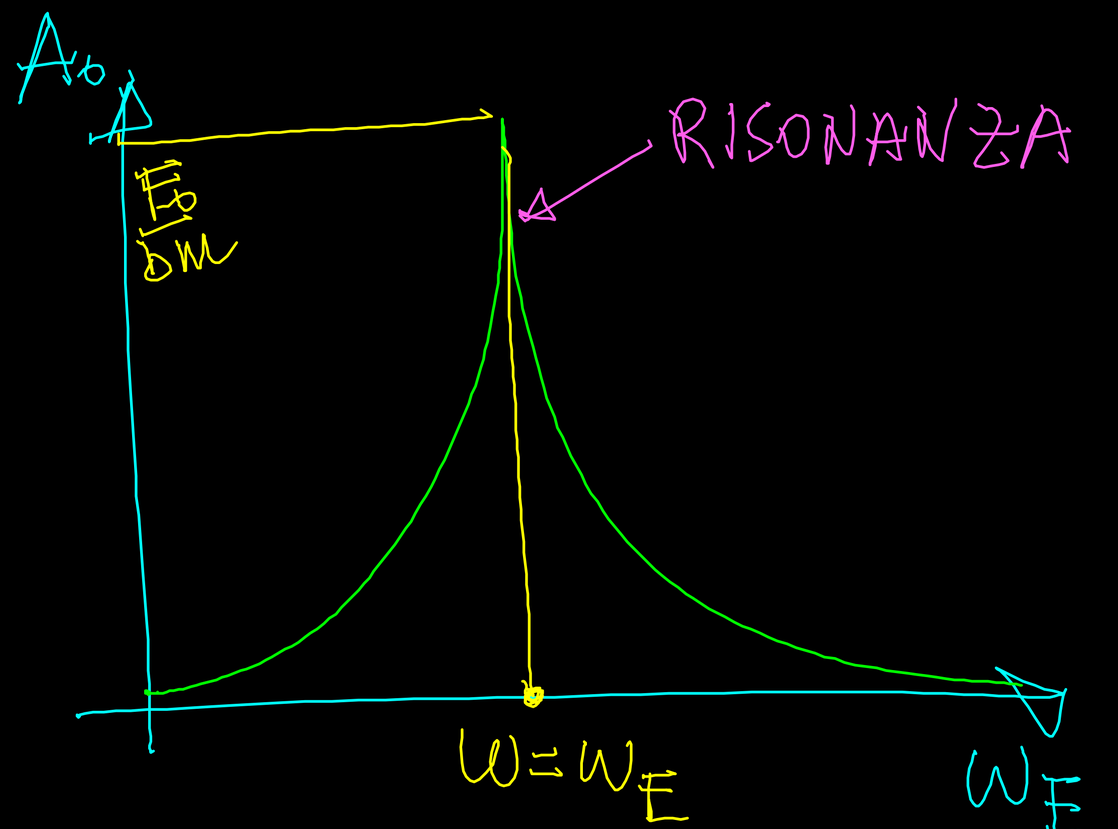
$$y(t) = A_0 \cos(\omega_E t - \varphi_E)$$

$\gamma = \frac{b}{m}$ $\omega = \sqrt{\frac{k}{m}}$

$$A_0 = \frac{(F_0/m)}{\sqrt{(\omega_E^2 - \omega^2)^2 + \gamma^2 \omega_E^2}}$$

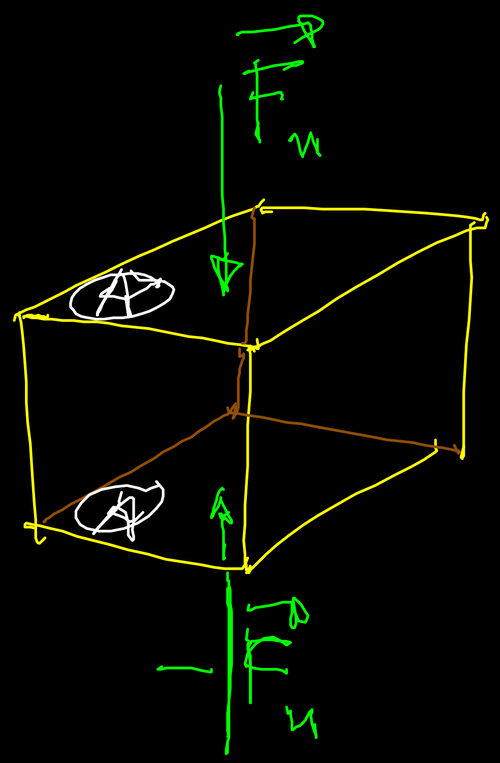
FORZ. NAT.

$$\tan \varphi_E = \frac{\gamma \omega_E}{\omega^2 - \omega_E^2}$$



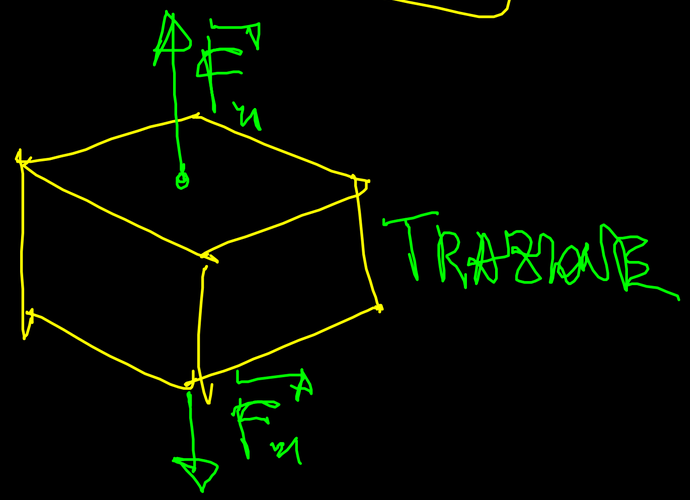
(ALCUNE) PROPRIETA' DEI SOLIDI

"SFORZO" $= \dfrac{\text{FORZA}}{\text{SUP. DI APPLICAZ.}}$ $\qquad \sigma = \dfrac{F}{A} \left[\dfrac{N}{m^2}\right] = [Pa]$ PASCAL



COMPRESSIONE

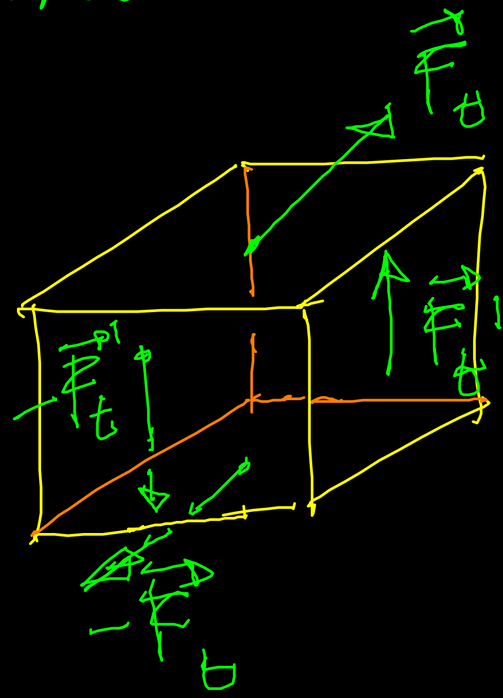
$$\sigma_n = \frac{F_n}{A}$$



SFORZO NORMALE DI COMPRESSIONE

SFORZO NORMALE DI TRAZIONE

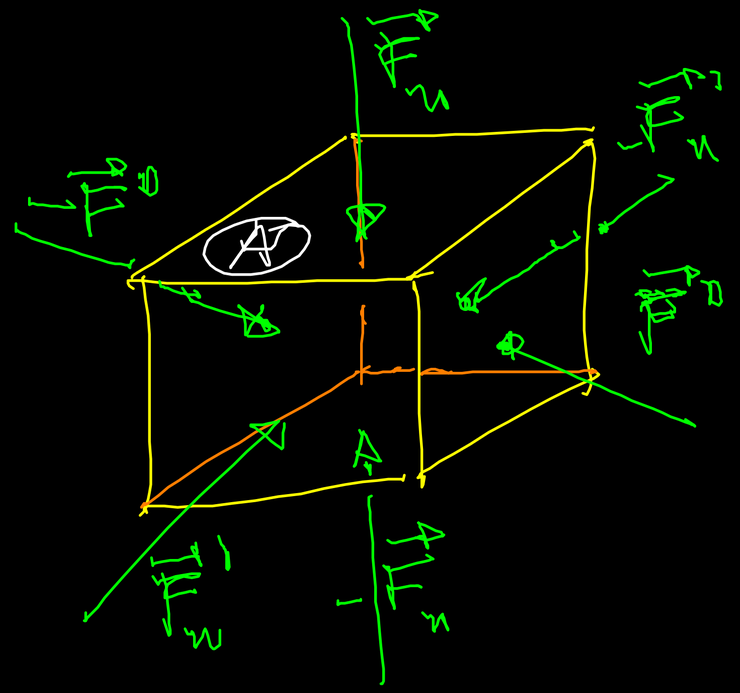
TAGLIO



$$\sigma_s = \frac{F_t}{A}$$

SFORZO DI TAGLIO

PRESSIONE

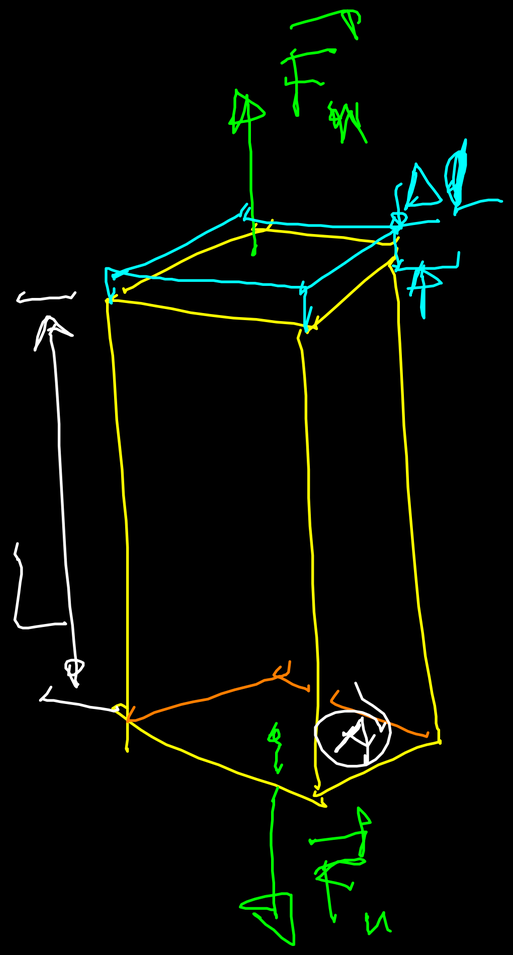


$$F_n = F_n' = F_n''$$

$$P = \frac{F_n}{A}$$

PRESSIONE

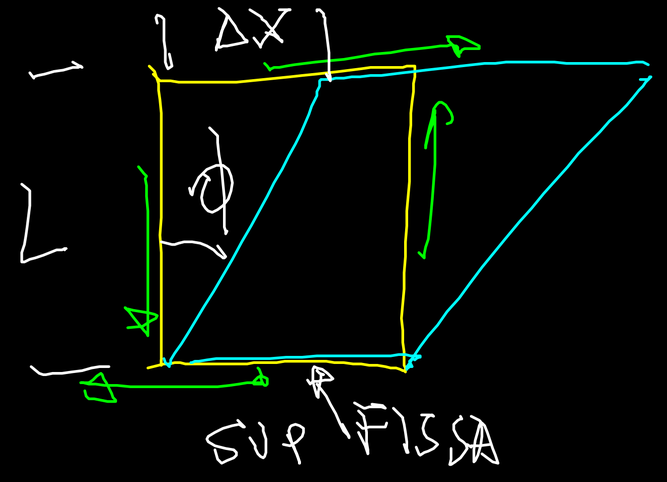
DEF. DI COMPRESSIONE (TRAZIONE)



$$\varepsilon_L = \frac{\Delta L}{L}$$

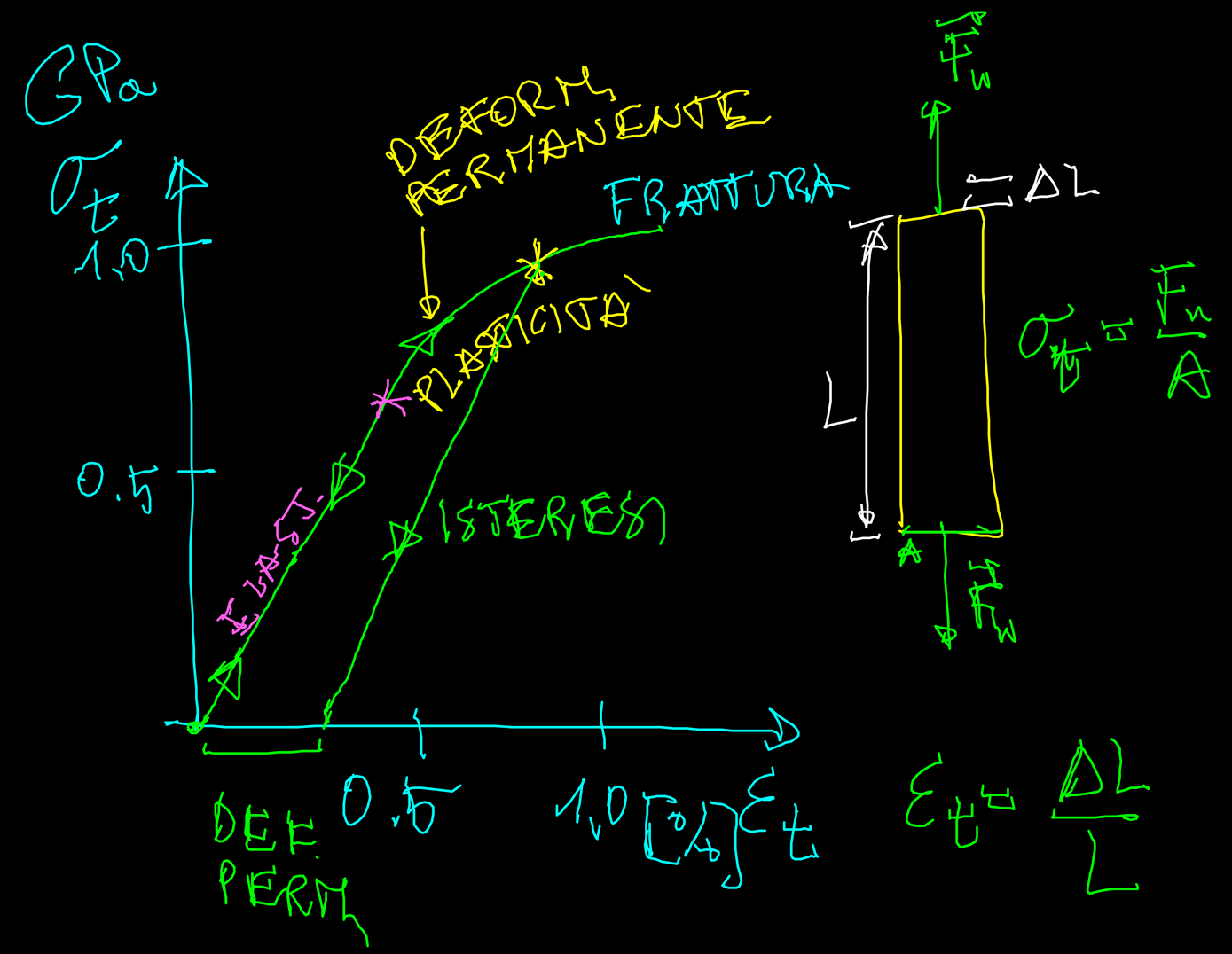
DEF. DI COMPR. O TRAZIONE

DEF. DI TAGLIO



$$\varepsilon_S = \phi \approx \frac{\Delta x}{L}$$

DEF. DI TAGLIO



$\varepsilon_t = \frac{\Delta L}{L}$

ZONA LINEARE
(ELASTICITA' O
"LEGGE" DI HOOKE)

$$Y = \frac{\sigma_u}{\varepsilon_t} = \frac{F_u/A}{\frac{\Delta L}{L}}$$

$$\sigma_u = Y \varepsilon_t$$

MODULO DI
YOUNG
(TRAZ. O COMPR.)

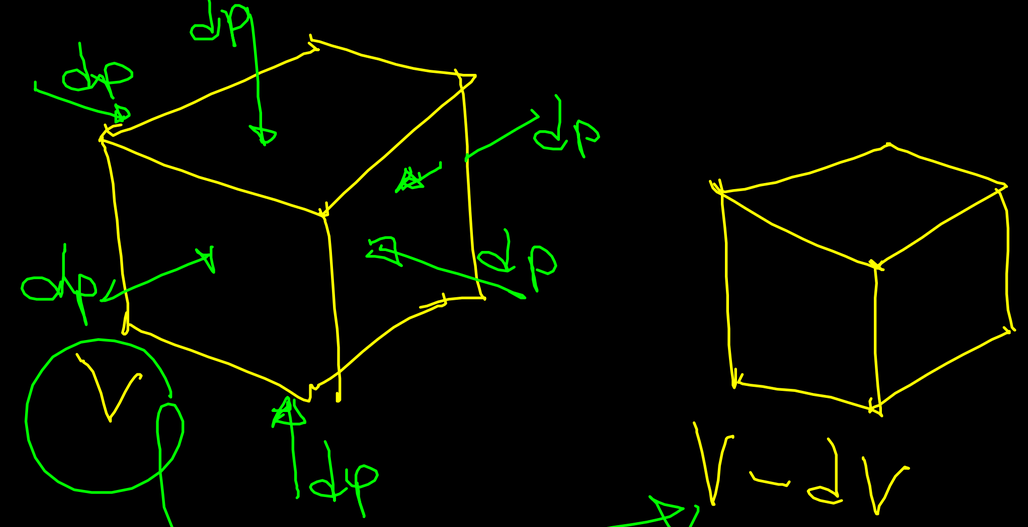
MODULO DI ELASTICITA' A TAGLIO

$$S = \frac{\sigma_s}{\varepsilon_s}$$

$$\sigma_s = S\,\varepsilon_s = \frac{F_t/A}{\Delta x/L}$$

MODULO DI EL. CUBICA O DI COMPRESSIONE

$$B = \frac{dP}{-\frac{dV}{V}} = -V\frac{dP}{dV}$$



$$V_{var.rel} = -\frac{dV}{V}$$