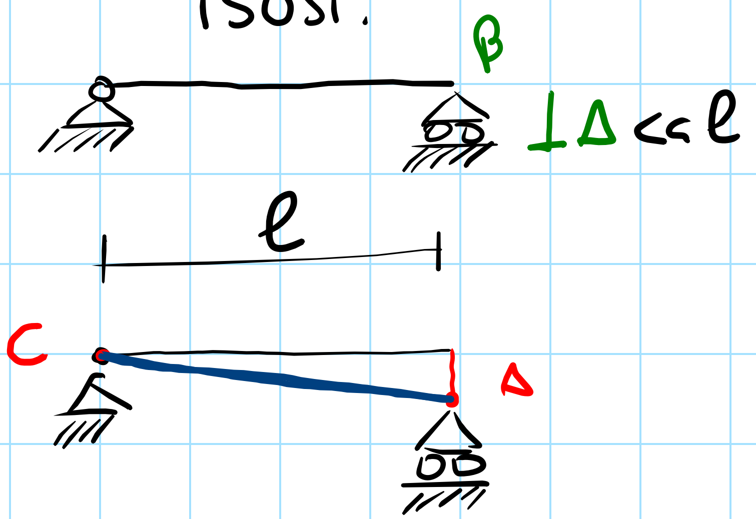
CEDIMENTI ANELASTICI NELLE STRUTTURE

18/12/25

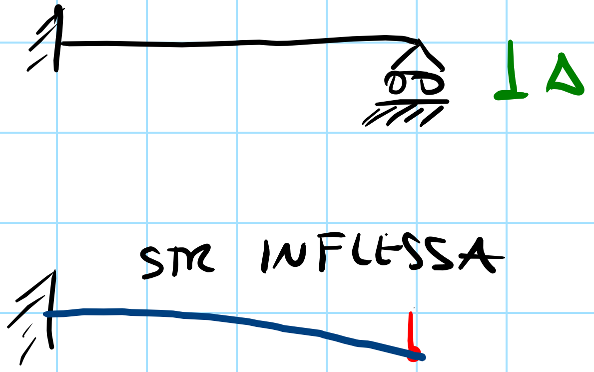
ISOST.



LA STRUTTURA "RUOTA"
(SI MUOVE RIGIDAMENTE)
E RAGGIUNGE UNA NUOVA
CONFIGURAZ.

NO REAZ. VINCOLARI
NO SOLLECITAZ (CDS NULLE)

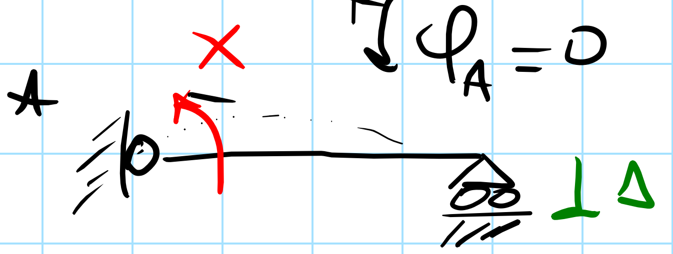
IPER



LA STR. SI INFLETTE
(NASCONO SOLLECITAZ.
→ CDS ≠ 0 ← INDOTTE
DAL CEDIMENTO)

M, Q, N funz. del
cedimento (Δ)

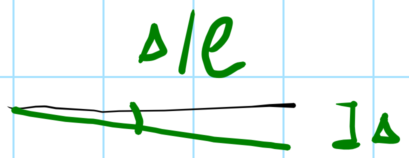
PROPPED
CANTILEVER



$$\varphi_A(\Delta, X) = 0$$

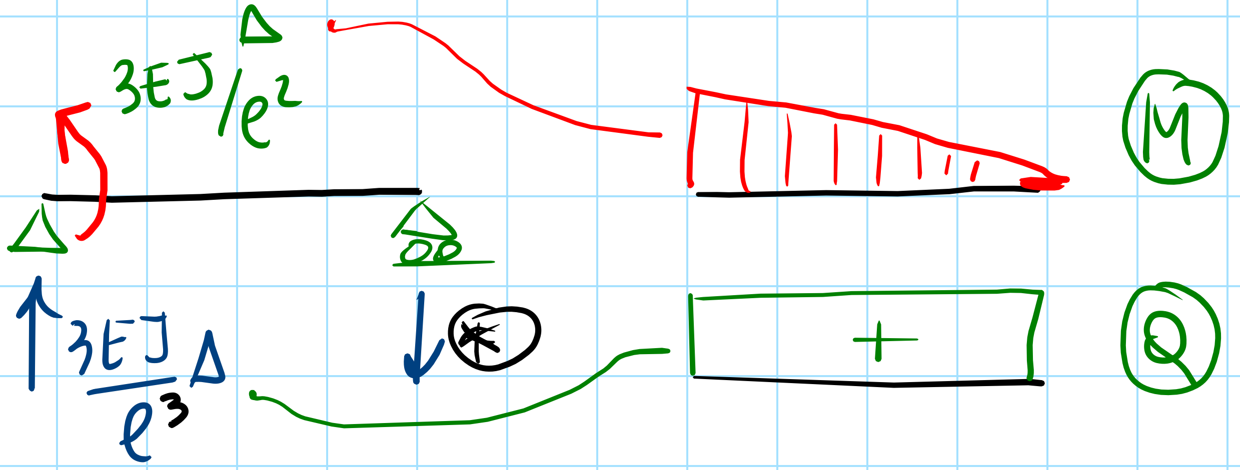
$$\varphi_A(X) = \frac{Xl}{3EJ}$$

$$\varphi_A(\Delta)$$

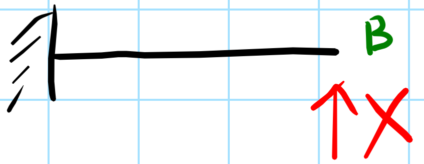


$$= -\Delta / l$$

$$\frac{Xl}{3EJ} - \frac{\Delta}{l} = 0 \; ; \; X = \frac{3EJ\Delta}{l^2}$$

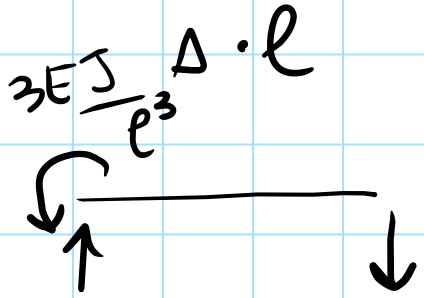


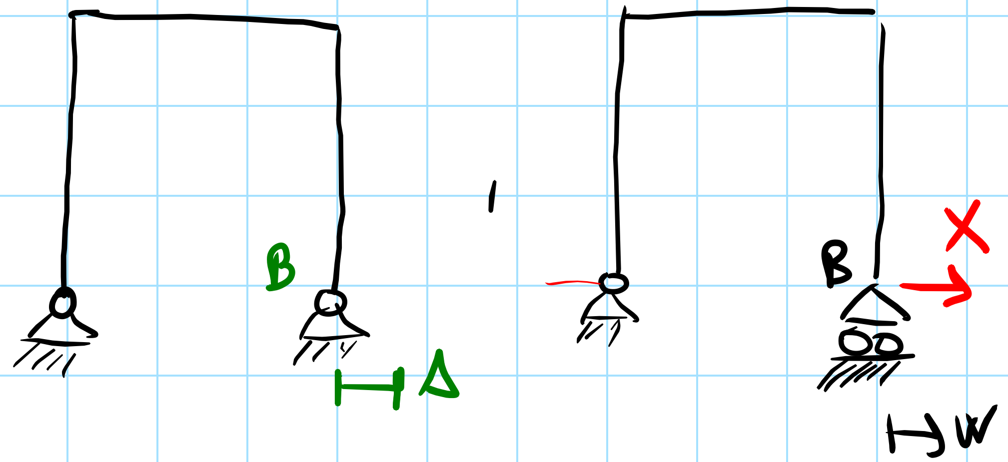
IN ALTERNATIVA:



$v_B = \Delta \downarrow +$ $\quad [v_B(X)]$

$$-\frac{X\ell^3}{3EJ} = \Delta \Rightarrow X = -\frac{3EJ}{\ell^3}\Delta \quad (*)$$

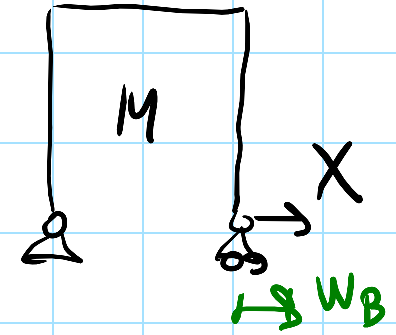




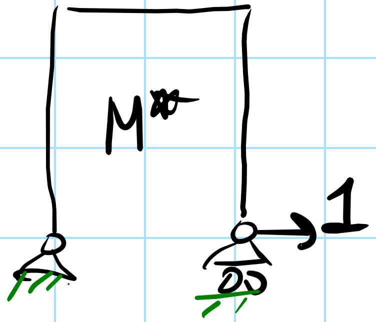
$\boxed{w_B = \Delta}$

w_B CON APPLICAZ. T.L.V.

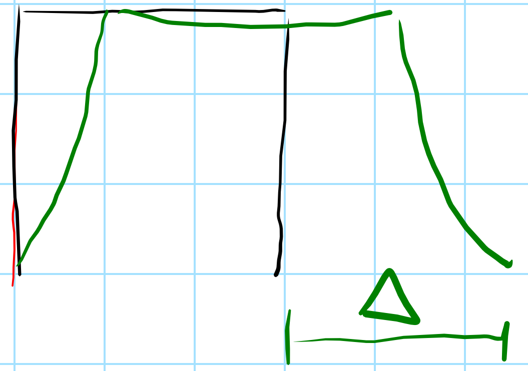
$$1 \cdot w_B = \int_{STR} M^* \frac{M}{EJ}\, ds$$



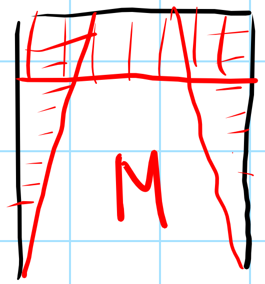
STR REALE

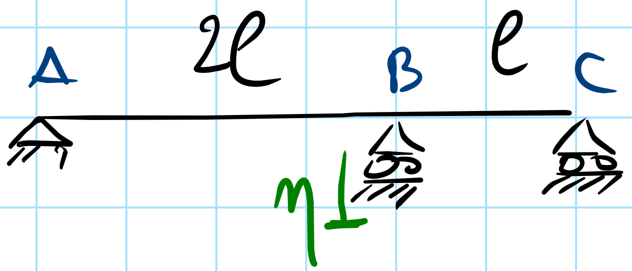


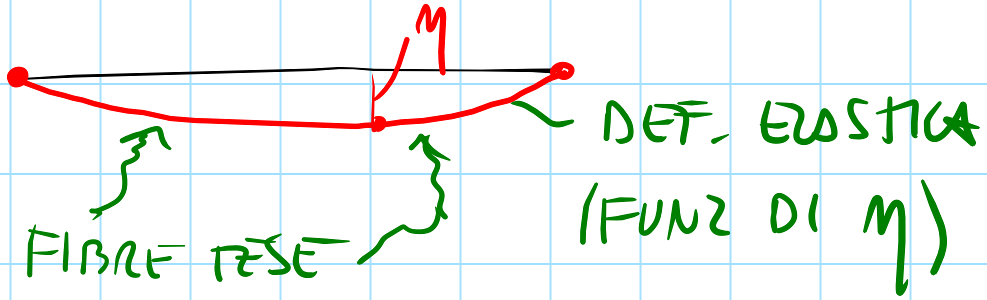
STR FITTIZIA

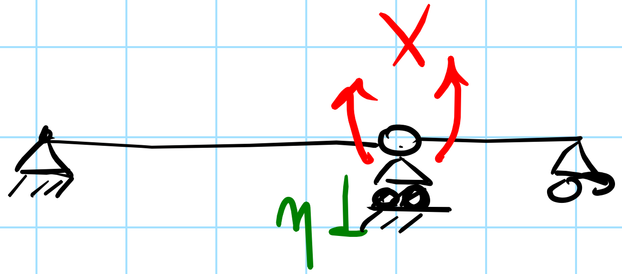


STR INFLESSA
M dipende
da X che
a sua volta dip da Δ

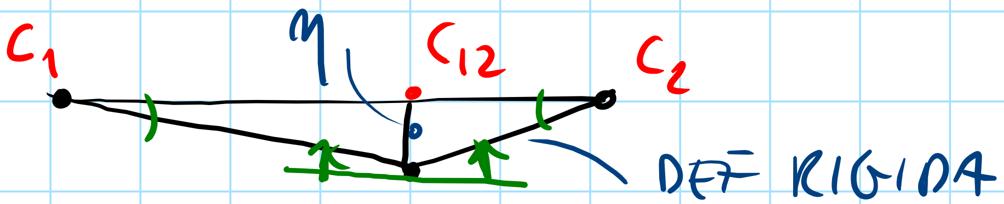




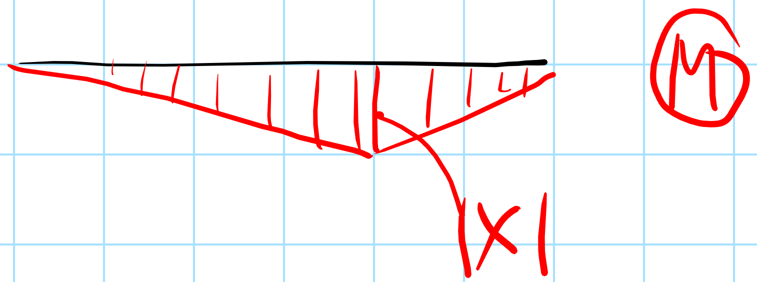


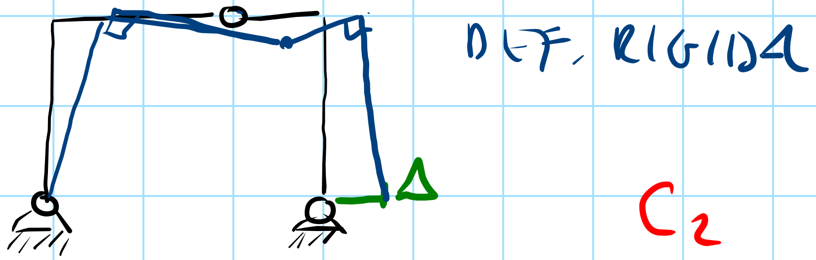


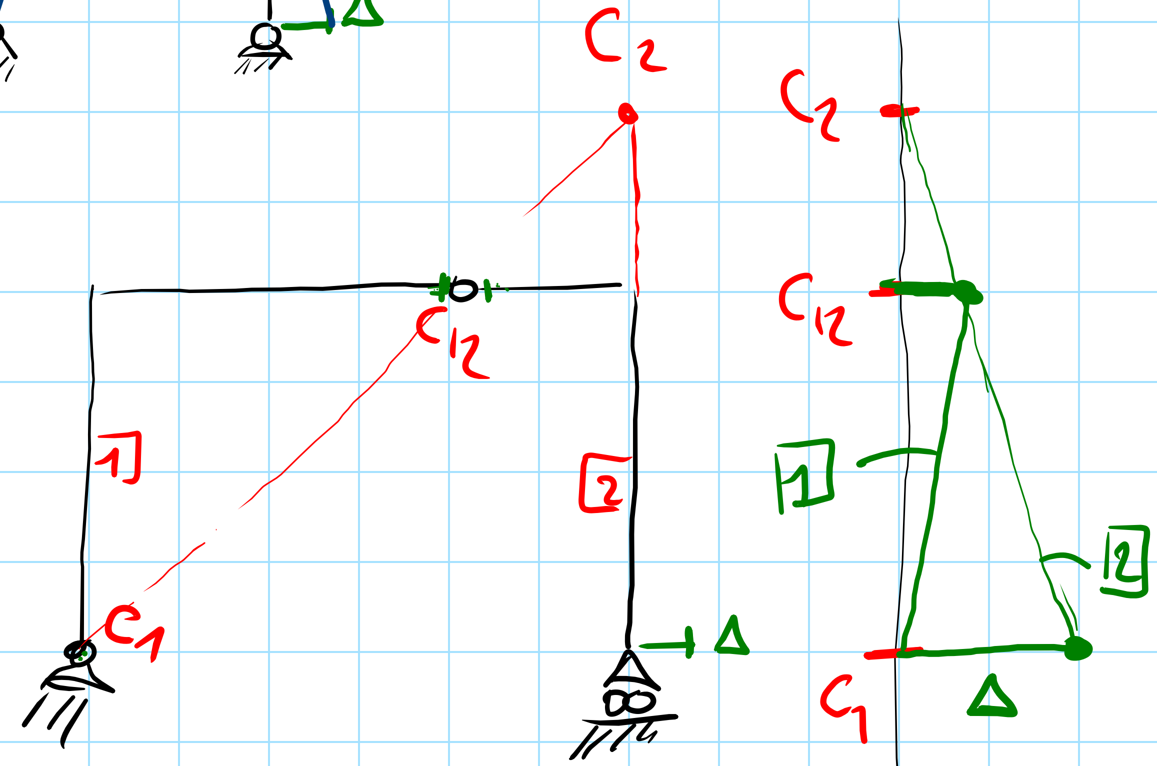
$$\varphi_{BA} = \varphi_{BC} \quad \circlearrowleft^{+}$$



$$-\frac{X\,2l}{3EJ} - \frac{\eta}{2l} = \frac{X\,l}{3EJ} + \frac{\eta}{2l} \qquad (X<0)$$





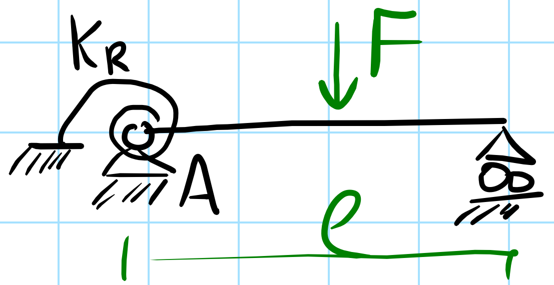


CINEMATISMO

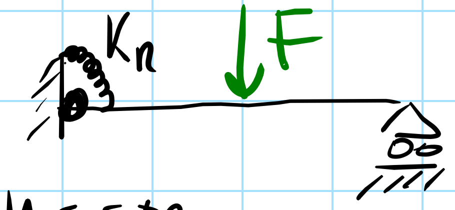
$C_2 \in$ asse carrello

$C_1 \leftrightarrow C_{12} \leftrightarrow C_2$

MOLLA ELASTICA ROTAZIONALE



STR 1 V. IPERST.

(


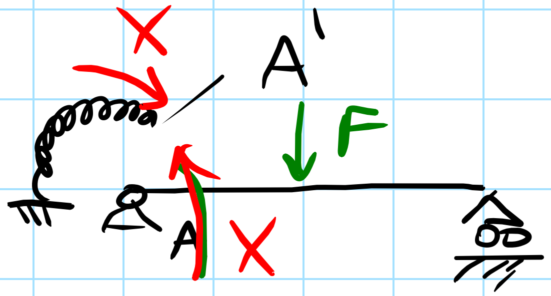
INCASTRO CEDEVOLE ELASTICO.)

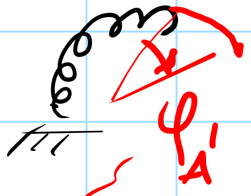
LEGGE ELASTICA

$$M = K_R \varphi$$

$$[K_R] = [FL]$$

Nm

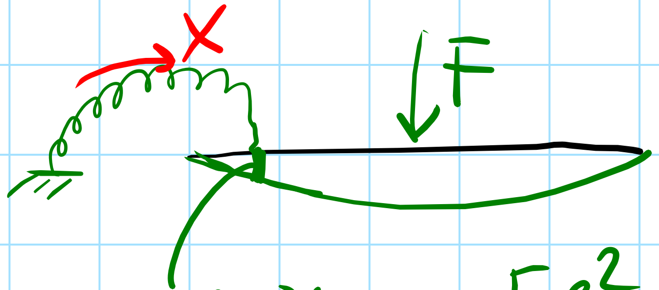




$$+\circlearrowright \quad \varphi_A = \varphi_{A'}$$

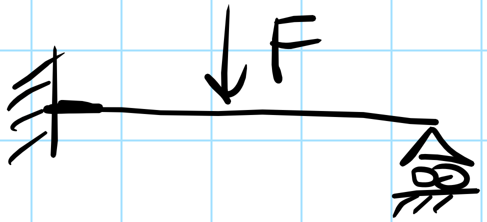
$$+\frac{Xl}{3EJ} - \frac{Fl^2}{16EJ} = -\frac{X}{K_R}$$

$$\boxed{X>0}$$



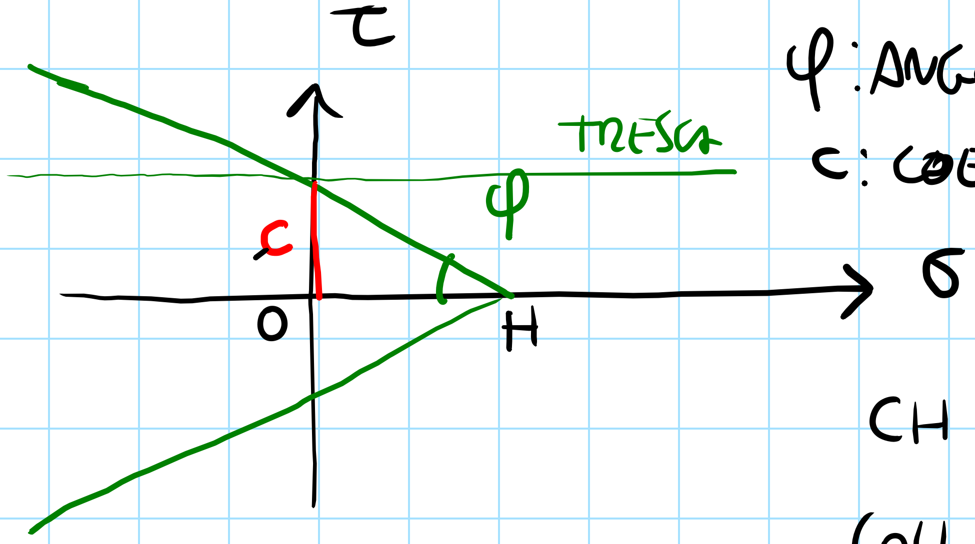
$\varphi = \frac{X}{K_R} < \frac{Fl^2}{16EJ}$ (ANGOLO IN ASSENZA DI MOLLA)

Se $K_R \to \infty$:

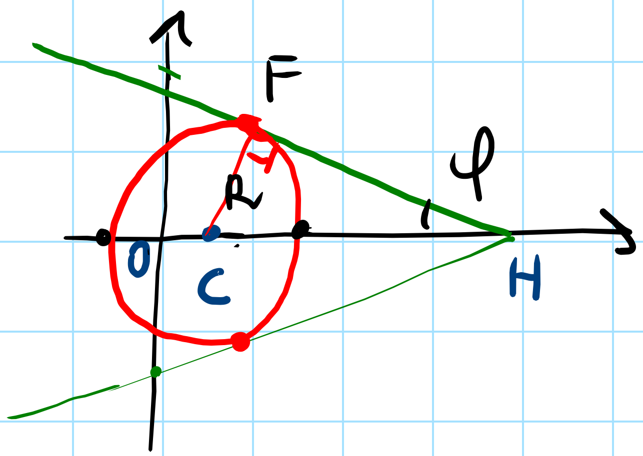


CRITERIO DI COULOMB-MOHR

$[f(\text{param.}) \le 0]$



φ: ANGOLO DI ATTRITO INTERNO ⎫ CARATT. DEL
c: COESIONE ⎭ MATERIALE



σ_I
σ_{III}

$$CH \sin\varphi = R$$

$$(OH - OC)\sin\varphi = R \,, \quad \left(\frac{c}{\operatorname{tg}\varphi} - \frac{\sigma_I + \sigma_{III}}{2}\right)\sin\varphi = \frac{\sigma_I - \sigma_{III}}{2}$$

$$(\sigma_I + \sigma_{III})\sin\varphi + \sigma_I - \sigma_{III} - 2c\cos\varphi = 0$$

$$\sigma_I(1+\sin\varphi) - \sigma_{III}(1-\sin\varphi) - 2c\cos\varphi = 0$$

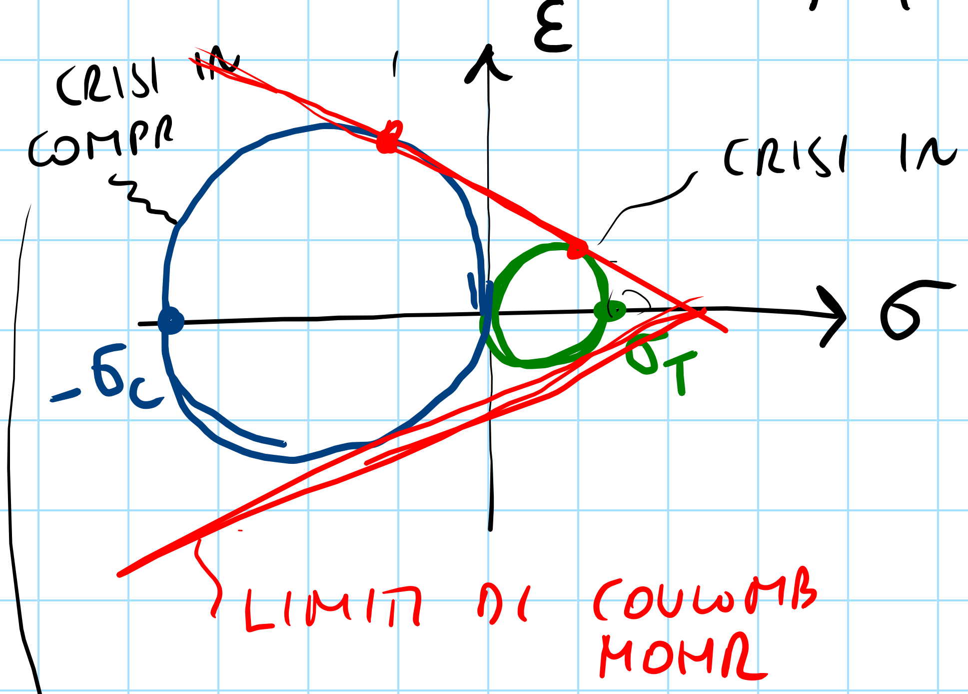
$$\sigma_I - \sigma_{III}\frac{1-\sin\varphi}{1+\sin\varphi} - 2c\frac{\cos\varphi}{1+\sin\varphi} = 0$$

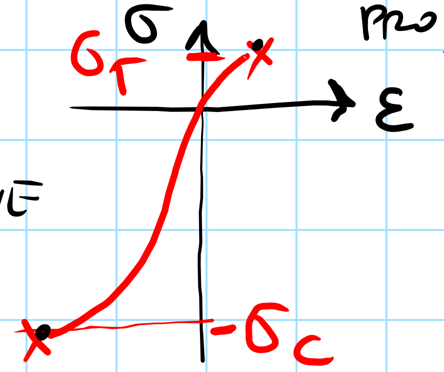
$$f = \max_{i,j = I,II,III}\left\{\sigma_i - \sigma_j \frac{1-\sin\varphi}{1+\sin\varphi}\right\} - \frac{2c\cos\varphi}{1+\sin\varphi} \le 0$$

$$f(\sigma_I, \sigma_{II}, \sigma_{III}\,;\, \underbrace{c, \varphi}^{K_i}) \le 0$$

$\varphi \to 0 \qquad f \to \text{TRESCA} \qquad (c \to \tau_0 = \sigma_0/2)$

$$f(\quad ; c, \varphi) \leq 0 \sim \tilde{f}(\quad ; \sigma_c, \sigma_T) \leq 0$$





$\sigma_T << \sigma_c$

CRISI IN TRAZ: $\sigma_T - \dfrac{2c\cos\varphi}{1+\sin\varphi} = 0 \; ; \; \sigma_T = \dfrac{2c\cos\varphi}{1+\sin\varphi}$

" " COMPR: $0 + \sigma_c \dfrac{1-\sin\varphi}{\cancel{1+\sin\varphi}} - \dfrac{2c\cos\varphi}{\cancel{1+\sin\varphi}} = 0 \; ; \; \sigma_c = \dfrac{2c\cos\varphi}{1-\sin\varphi}$

osservo che $\dfrac{\sigma_T}{\sigma_c} = \dfrac{1-\sin\varphi}{1+\sin\varphi}$

TRESCA: $\sigma_c = \sigma_T = \sigma_0$

$$\tilde{f} = \max_{i,j=I,II,III} \left\{ \sigma_i - \sigma_j \frac{\sigma_T}{\sigma_c} \right\} - \sigma_T \leq 0$$

CENNI ALL'ESISTENZA DEL POTENZIALE ELASTICO COMPLEMENTARE.

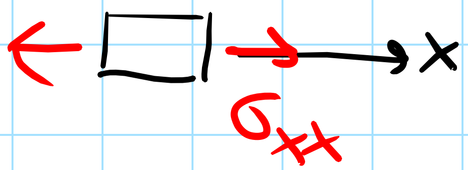
$\varphi(\underset{\sim}{\varepsilon})$: POTENZ. ELASTICO (DENSITA' DI ENERGIA ELASTICA)

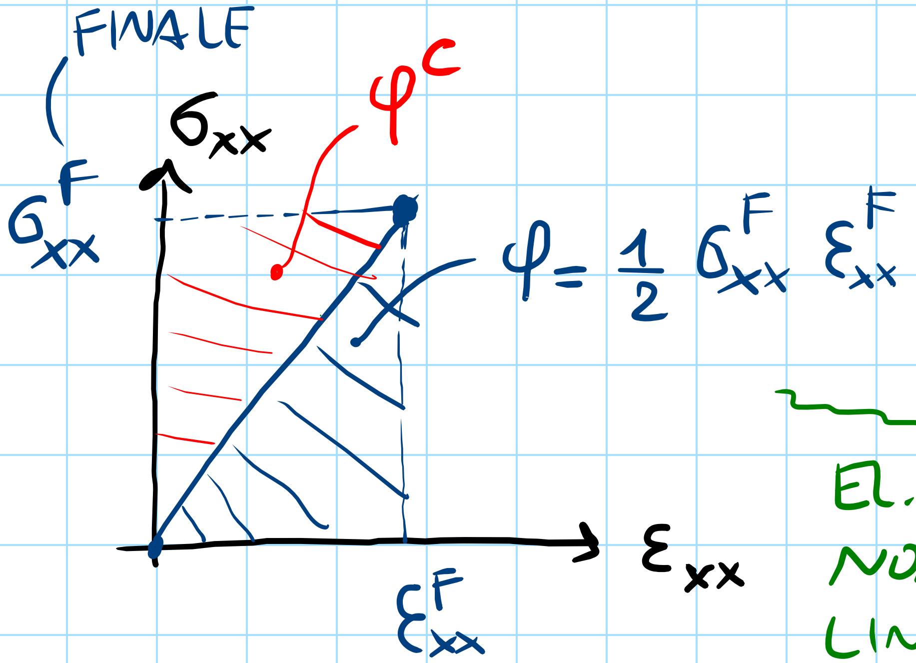
$\Phi = \int_V \varphi \, dV$ EN EL IMMAGAZZ. NEL CORPO

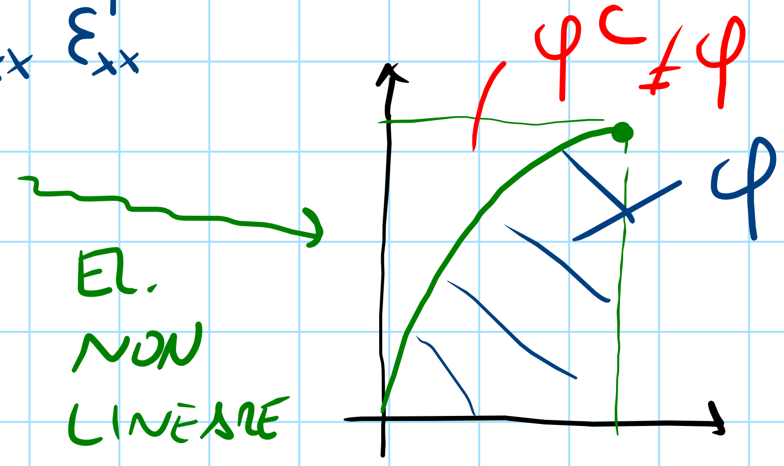
$$\sigma_{ij} = \frac{\partial \varphi}{\partial \varepsilon_{ij}}$$

$$\varphi(\underset{\sim}{\varepsilon}) = \frac{1}{2} \underbrace{\mathbb{C}\underset{\sim}{\varepsilon}}_{\underset{\sim}{\sigma}} \cdot \underset{\sim}{\varepsilon}$$

IN TENS. MONOASS.







$$\boxed{\varphi^c + \varphi = \sigma_{xx}^F \varepsilon_{xx}^F}$$

φ^c: POTENZ ELASTICO COMPL, IN ELASTICITA' LINEARE ASSUME LO STESSO VALORE NUMERICO DI φ

$$\varphi^c + \varphi = \sigma_{xx}^F \varepsilon_{xx}^F$$

Sulla base della proprietà $\varphi^c + \varphi = \underset{\sim}{\sigma} \cdot \underset{\sim}{\varepsilon}$ si può dimostrare che:

$$\varphi^c(\underset{\sim}{\sigma}) = \frac{1}{2} \underset{\sim}{\sigma} \cdot \mathbb{C}^{-1} \underset{\sim}{\sigma} \quad , \quad \varepsilon_{ij} = \frac{\partial \varphi^c}{\partial \sigma_{ij}}$$

$\Phi^c = \int_V \varphi^c \, dV$: EN ELASTICA COMPLEM.