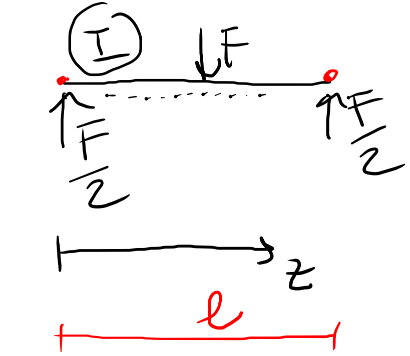
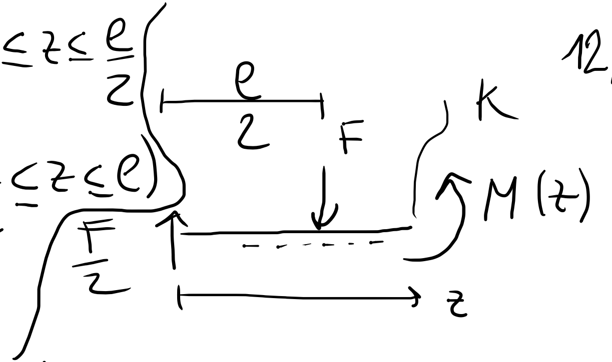
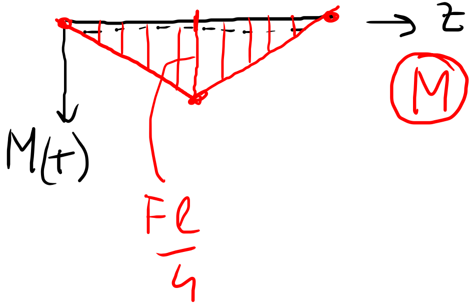
12/5/22



I → $M(z) = +\frac{F}{2} z \qquad 0 \le z \le \frac{l}{2}$

II → $M(z) = \frac{F}{2}(l - z) \qquad \frac{l}{2} \le z \le l$





M>0 dalle parte tratteggiate

<0 dalla parte opposta

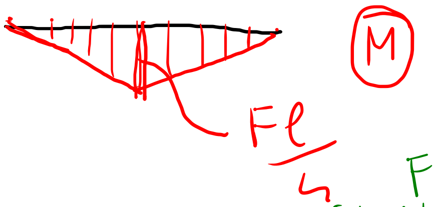
$K\!: \; -\frac{F}{2} z + F\left(z - \frac{l}{2}\right) + M(z) = 0$

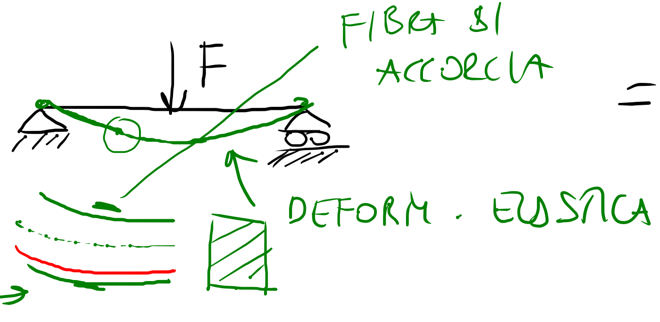
$$M(z) = +\frac{F}{2} z + F\left(\frac{l}{2} - z\right)$$

$$= \frac{Fl}{2} - Fz + \frac{F}{2} z = \frac{Fl}{2} - \frac{F}{2} z$$

$$= \frac{F}{2}(l - z)$$

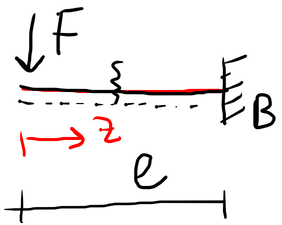
IN M NON CI VA IL SEGNO.



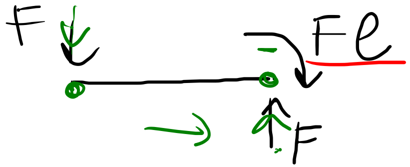


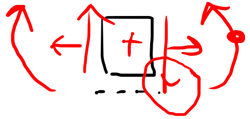
IL DIAGR. DEL MOMENTO È RIPORTATO DALLA PARTE DELLE FIBRE TESE

ES. MENSOLA



S.C.L.





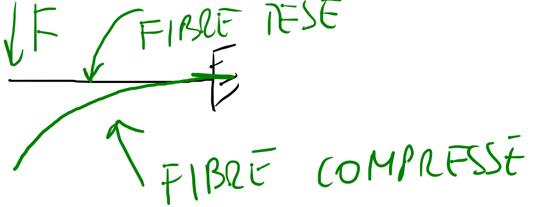
N: $\downarrow F$ —— $\rightarrow N$ $\Longrightarrow$ $N(z)=0$

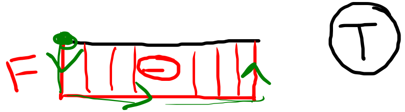
T: $\downarrow F$ —— $\downarrow T(z)$ $\Longrightarrow$ $\downarrow + : \; +F + T(z) = 0$

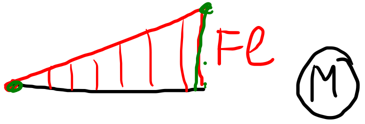
$$T(z) = -F$$

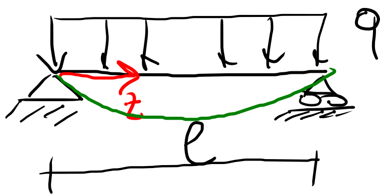
M: $\downarrow F$ —— $\circlearrowleft M(z)$, K $\quad$ $K \circlearrowleft^{+} : \; +Fz + M(z) = 0$

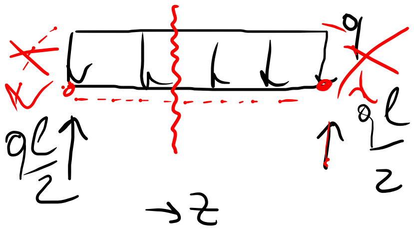
$$M(z) = -Fz \quad (<0)$$

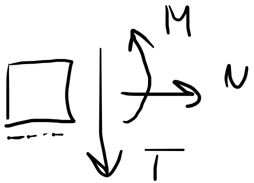




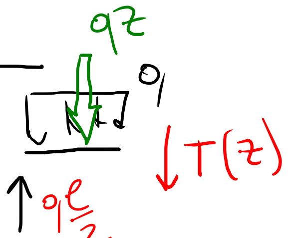








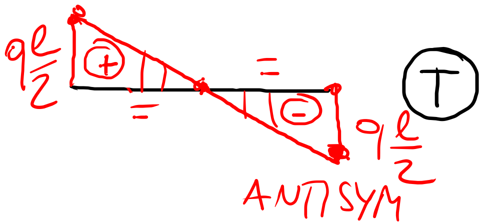
$\underline{N=0}$

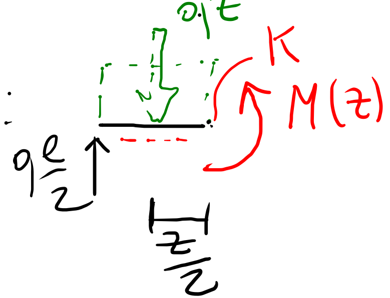


T:

$+\uparrow: \; +q\frac{\ell}{2} - qz - T(z) = 0$

$T(z) = q\frac{\ell}{2} - qz \;; \quad T(0) = q\ell/2 \quad T(\ell) = -q\ell/2$



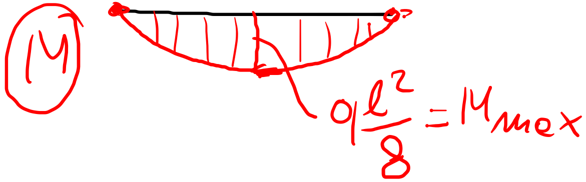


M:

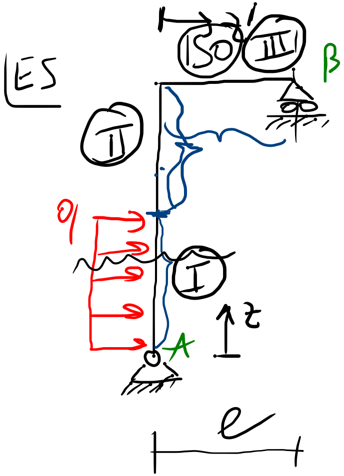
$K \circlearrowleft^{+}: \; -q\frac{\ell}{2} z + qz \cdot \frac{z}{2} + M(z) = 0$

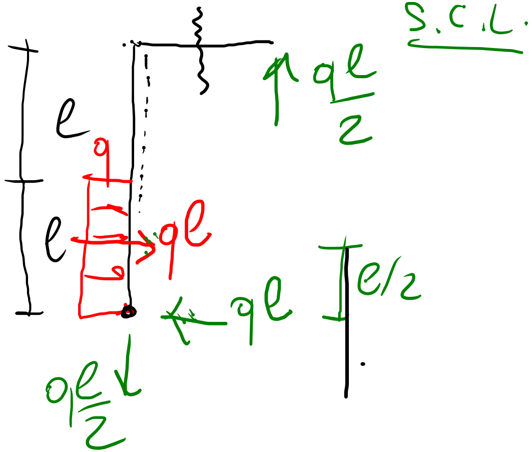
$M(z) = q\frac{\ell}{2} z - q\frac{z^2}{2}$

SYM.



$M\left(\frac{\ell}{2}\right)? = q\frac{\ell}{2}\frac{\ell}{2} - \frac{q}{2}\frac{\ell^2}{4} = q\ell^2 \frac{1}{8}$

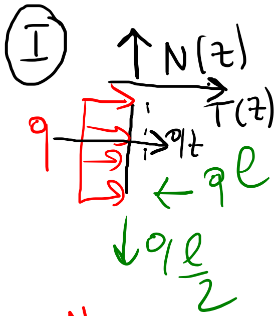




I $\quad 0 \le z \le \ell$

II $\quad \ell \le z \le 2\ell$

III $\quad 0 \le z' \le \ell$

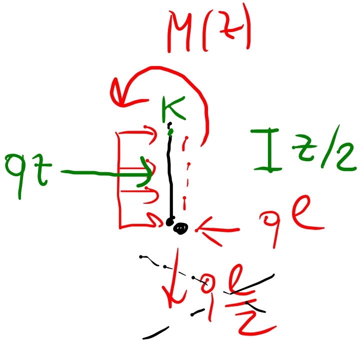


$$+\uparrow: -q\frac{\ell}{2} + N(z) = 0$$

$$N(z) = +q\ell/2$$

$$\overset{+}{\rightarrow}: -q\ell + qz + T(z) = 0$$

$$T(z) = q\ell - qz$$

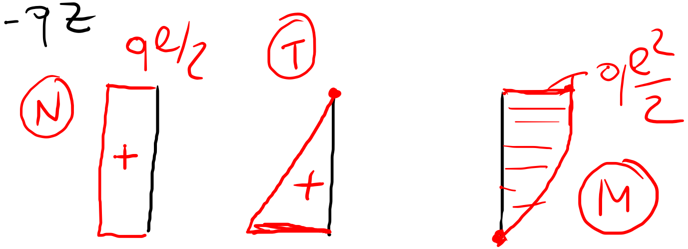


$$K \circlearrowleft^{+}: -q\ell z + qz\cdot\frac{z}{2} + M(z) = 0$$

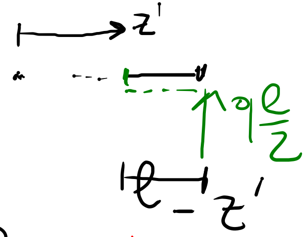
$$M(z) = q\ell z - q\frac{z^2}{2}$$

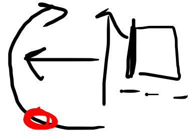
$$M(0) = 0$$

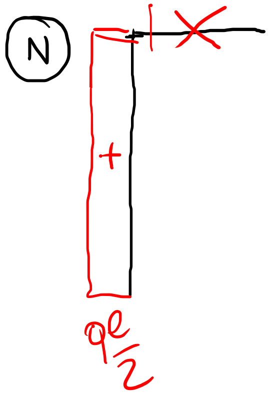
$$M(\ell) = q\ell^2 - q\frac{\ell^2}{2} = +q\frac{\ell^2}{2}$$

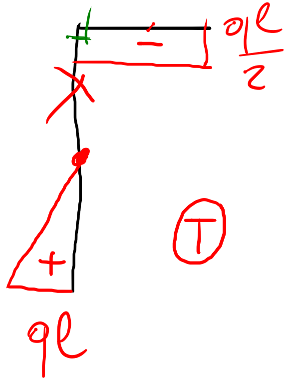


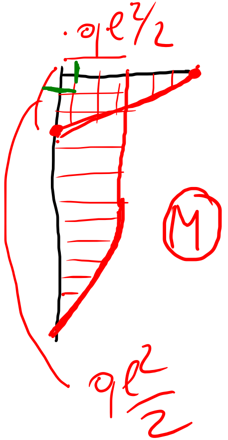
III





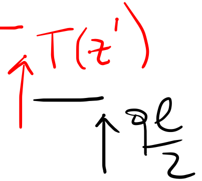






$N = 0$

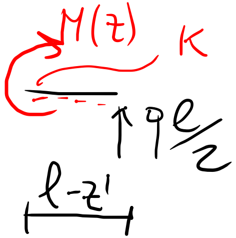
T:



$\uparrow + : \; +T(z') + q\frac{l}{2} = 0$

$T(z') = -q\frac{l}{2}$

M:

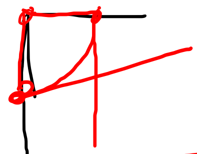


$K \circlearrowleft^{+} : \; -M(z') + q\frac{l}{2}(l-z') = 0$

$M(z') = q\frac{l}{2}(l-z')$

$M(0) = q\frac{l^2}{2} > 0$

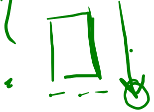
$M(l) = 0$

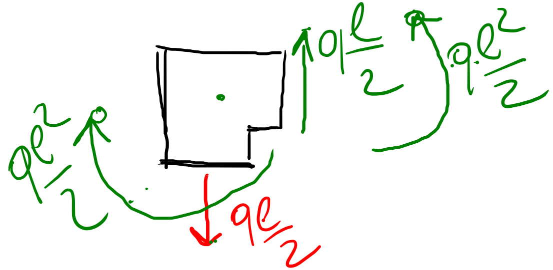


RIBALT. INTERNO DEL DIAGR. M.

OSSERV. SUL NODO

EQUILIBRIO?



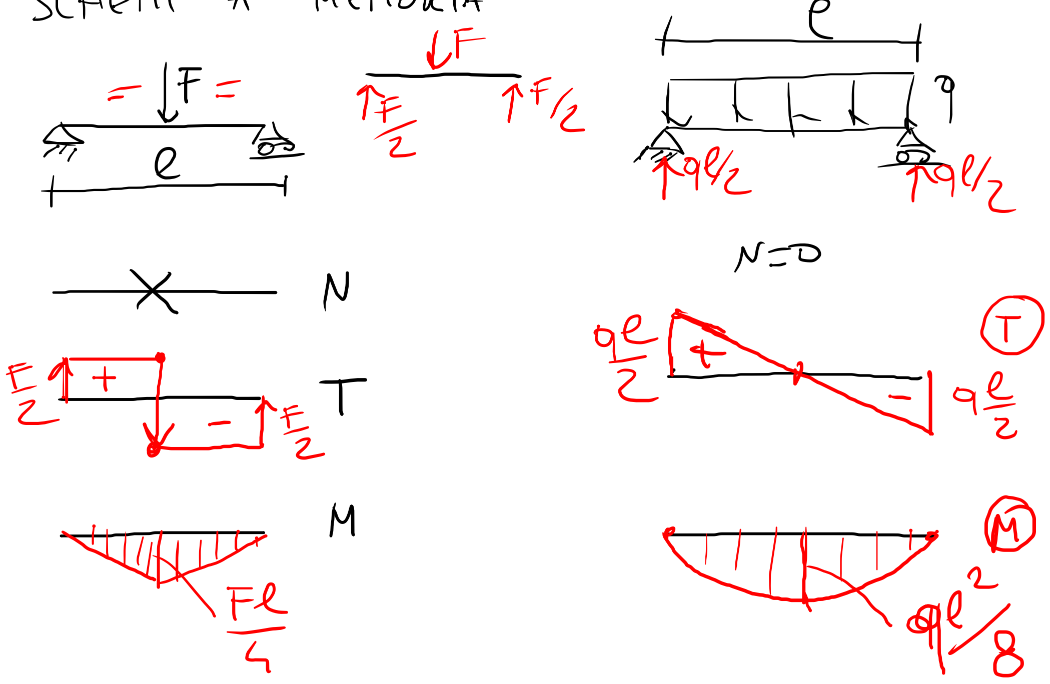


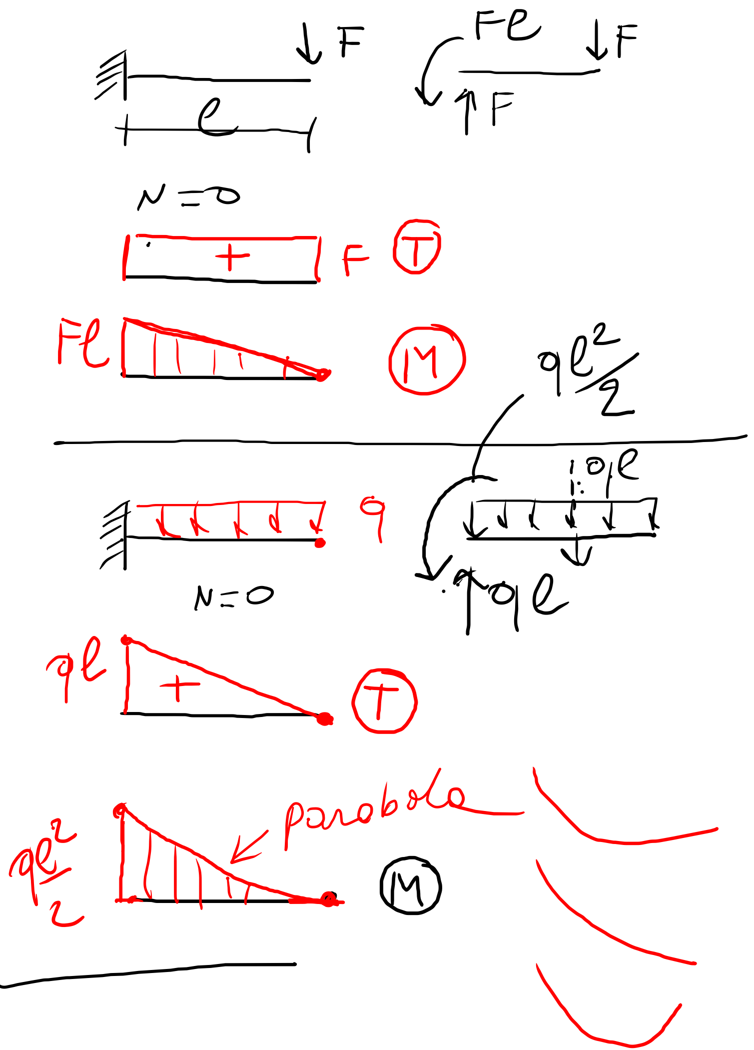
EQUIL. VERT: OK

ORIZZ: NO FORZE, OK

ALLA ROTAZ: OK

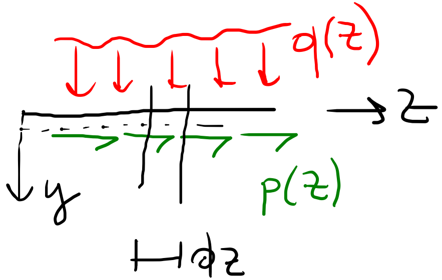
SCHEMI A MEMORIA

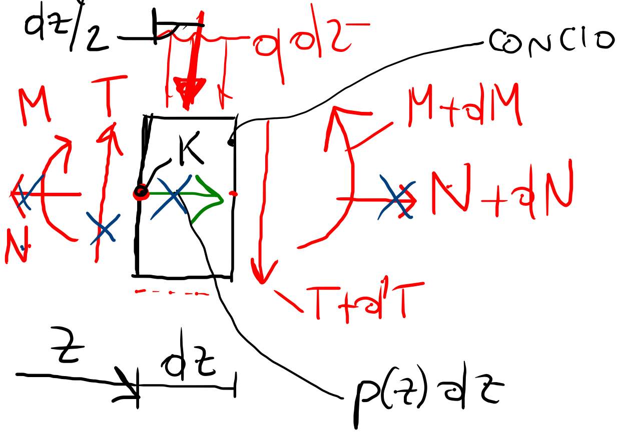




CHE RAPPORTO C'È TRA CARICHI E DIAGRAMMI DELLE CDS?

EQUAZ. INDEFINITE DI EQUILIBRIO PER TRAVI RETTILINEE





STUDIO L'EQUIL. DEL CONCIO

$p, q = \frac{F}{L}$

$\overset{+}{\rightarrow}: \; -\cancel{N}+p\,dz+\cancel{N}+dN=0 \Rightarrow p\,dz+dN=0 \Rightarrow \boxed{\frac{dN}{dz}=-p}$

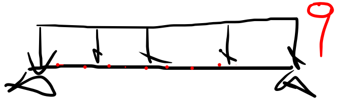
$+\uparrow: \; +\cancel{T}-q\,dz-\cancel{T}-dT=0 \Rightarrow dT=-q\,dz \Rightarrow \boxed{\frac{dT}{dz}=-q}$

$\overset{+}{\circlearrowleft}_K: \; -\cancel{M}-q\,dz\cdot\frac{dz}{2}-(T+dT)\,dz+\cancel{M}+dM=0$

$-q\frac{(dz)^2}{2}-T\,dz-dT\,dz+dM=0 \rightarrow \boxed{\frac{dM}{dz}=T}$

SONO DI ORDINE SUPERIORE, NON SI CONSIDERANO

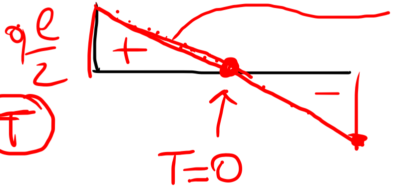
RIASSUMENDO



$$\frac{dN}{dz} = -p(z)$$

$$\frac{dT}{dz} = -q(z)$$

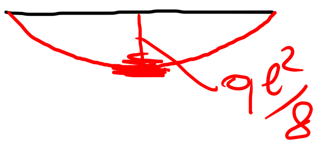
T



$T(z) = q\frac{\ell}{2} - qz$: $\frac{dT}{dz} = -q$ $\forall z$

$$\frac{dM}{dz} = T(z)$$

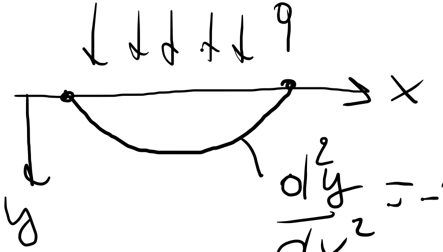
M



$T=0 \Rightarrow \frac{dM}{dz} = 0 \Rightarrow$ M ha un punto di stazionarietà (MAX o MIN)

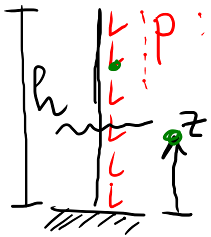
$$\frac{d^2M}{dz^2} = \frac{dT}{dz} = -q(z)$$

CURVATURA DEL MOM. $\equiv -q(z)$: ANALOGIA DEL FILO TESO

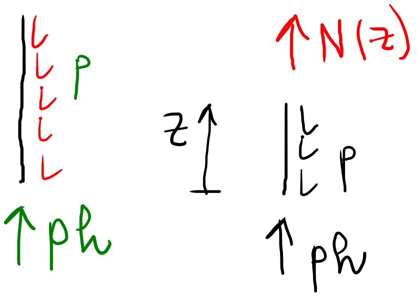


$$\frac{d^2y}{dx^2} = -q(x)$$

ESERCIZIO SUL PESO PROPRIO DI UN PILASTRO



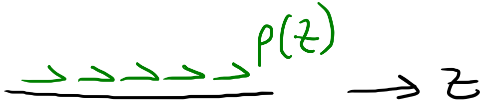
p : CARICO DISTRIBUITO COSTANTE $\quad [p] = \left[\frac{F}{L}\right]$



$$\uparrow + : \; +ph - pz + N(z) = 0$$

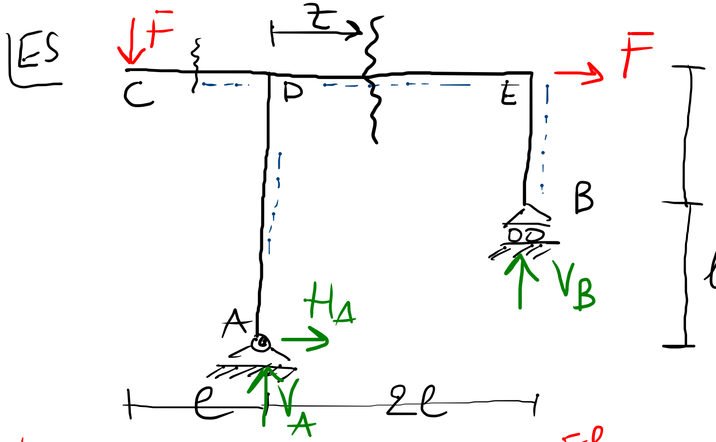
$$N(z) = pz - ph \quad \begin{cases} N(0) = -ph \\ N(h) = 0 \end{cases}$$

Ricordo $\boxed{\frac{dN}{dz} = -p(z)}$; Per la mia funzione:



$$\frac{dN(z)}{dz} = +p$$

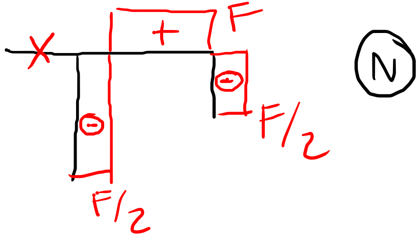
Il nostro carico costante p è un carico NEGATIVO SE RIPORTATO ALLA CONVENZ. DELL'EQ. DIFF. GENERALE!

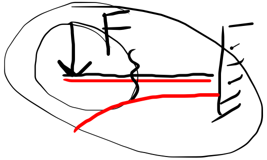


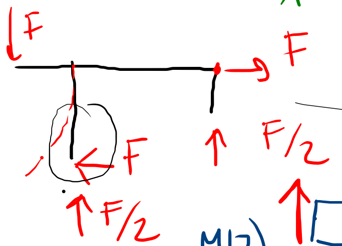
$$\xrightarrow{+}: +H_A + F = 0 \qquad H_A = -F$$

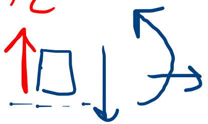
$$\uparrow +: +V_A - F + V_B = 0 \qquad V_A = F - V_B = F/2$$

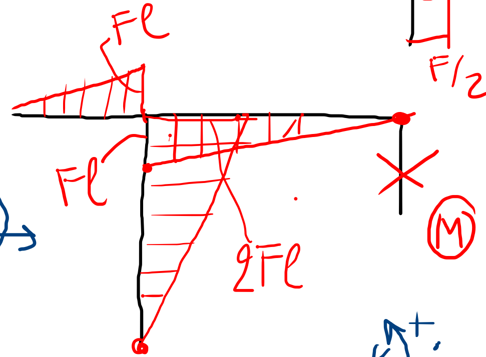
$$A \circlearrowleft^{+}: F\ell - F2\ell + V_B 2\ell = 0 \;;\; V_B = +\frac{F}{2}$$

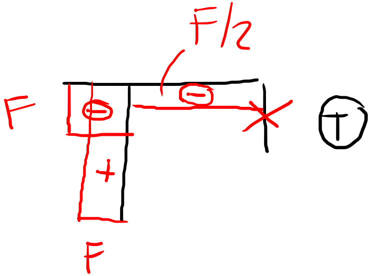


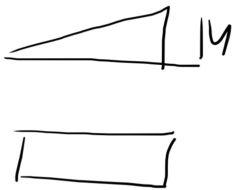


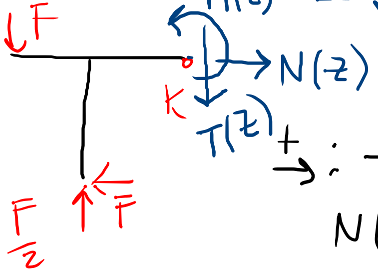












$$\xrightarrow{+}: -F + N(z) = 0$$

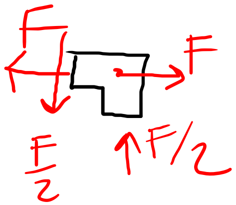
$$N(z) = +F$$

$$+\uparrow: +\frac{F}{2} - F - T(z) = 0 \;;\; T(z) = -\frac{F}{2}$$

$$K \circlearrowleft^{+}: -\frac{F}{2}z - F2\ell + F(\ell + z) + M(z) = 0$$

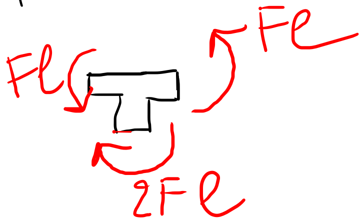
$$M(z) = F\ell - \frac{F}{2}z \quad \begin{cases} M(0) = F\ell \\ M(2\ell) = 0 \end{cases}$$

EQUIL. E

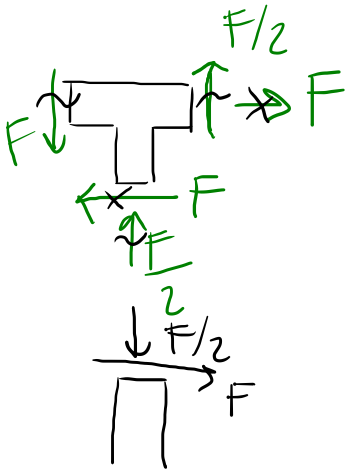


OK!

EQUIL D.

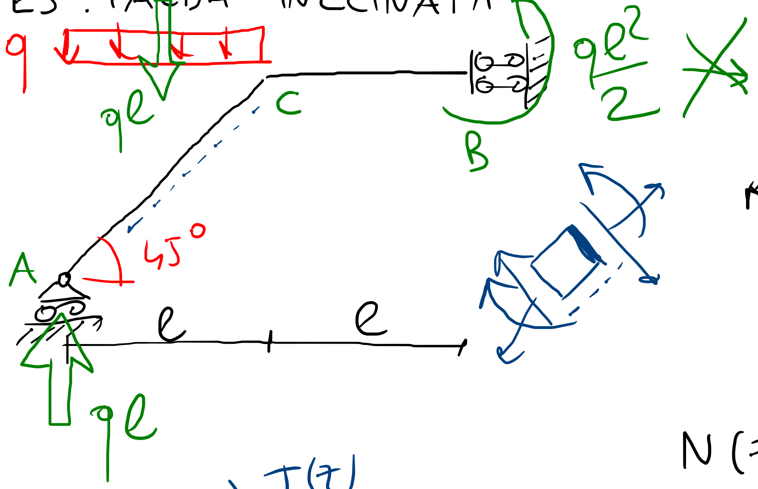


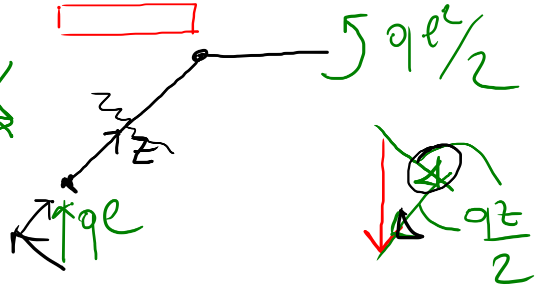
OK!

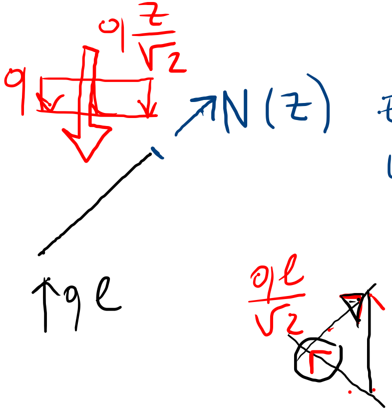


OK!

ES. FALDA INCLINATA







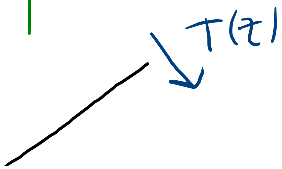
EQUIL
LUNGO z

$+\nearrow$:

$$N(z) - \frac{qz}{2} + \frac{q\ell}{\sqrt{2}} = 0 \quad ; \quad N(z) = \frac{qz}{2} - \frac{q\ell}{\sqrt{2}}$$

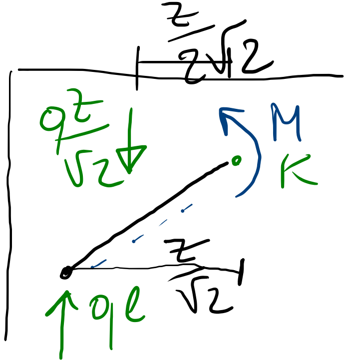
$$N(0) = -q\ell/\sqrt{2}$$

$$N(\ell\sqrt{2}) = 0$$



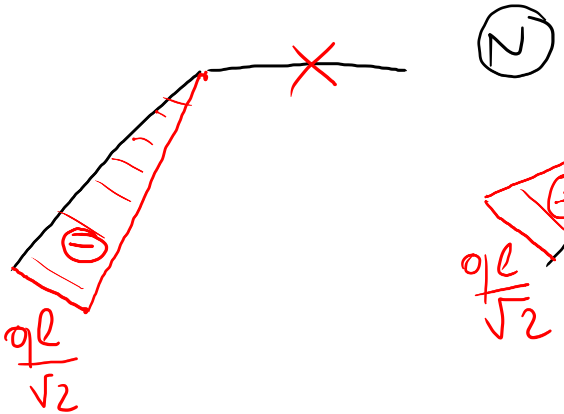
$$\searrow^{+} : \ +T(z) + q\frac{z}{2} - \frac{q\ell}{\sqrt{2}} = 0$$

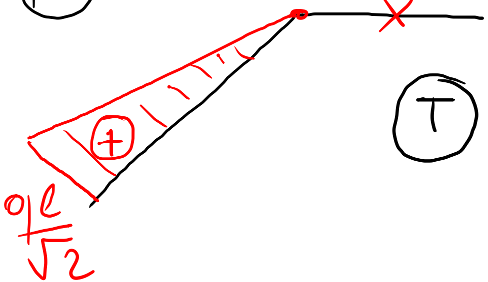
$$T(z) = \frac{q\ell}{\sqrt{2}} - \frac{qz}{2} \ \rightarrow T(0) = +\frac{q\ell}{\sqrt{2}}, \quad T(\ell\sqrt{2}) = 0$$

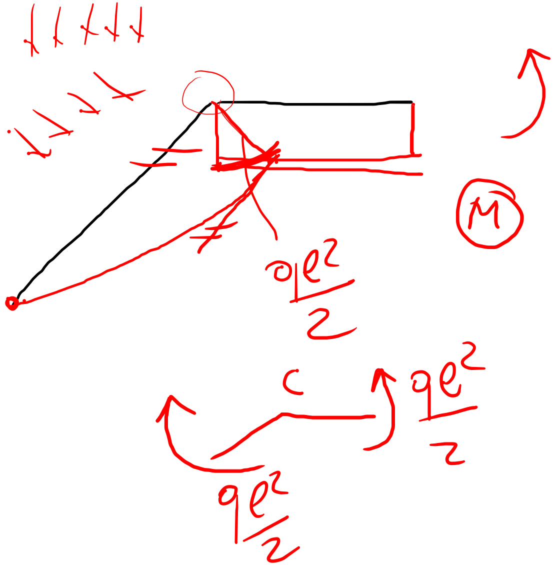


$$K\circlearrowleft^{+} : \ -q\ell \cdot \frac{z}{\sqrt{2}} + \frac{qz}{\sqrt{2}} \cdot \frac{z}{2\sqrt{2}} + M(z) = 0$$

$$M(z) = q\ell\frac{z}{\sqrt{2}} - \frac{qz^2}{4} \ \rightarrow M(0) = 0, \quad M(\ell\sqrt{2}) = \frac{q\ell^2}{2}$$


N
−
ql/√2


T
+
ql/√2


M
ql²/2
C
ql²/2
ql²/2