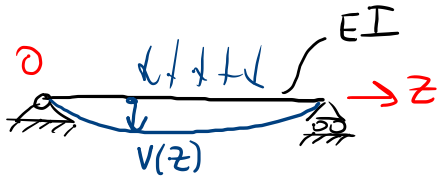
LINEA ELASTICA IV ORDINE

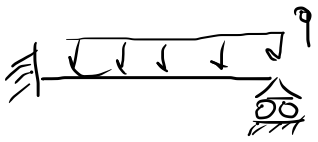
MADS, 5/10/22

LINEA ELASTICA DEL II ORDINE (TRAVI SNELLE)

$$\begin{cases} v''(z) = -\dfrac{M(z)}{EI} \\ 2\ \text{C. LIMITI} \end{cases}$$



PER STRUTT ISOST. (OVVO CALCOLARE IL M(z))

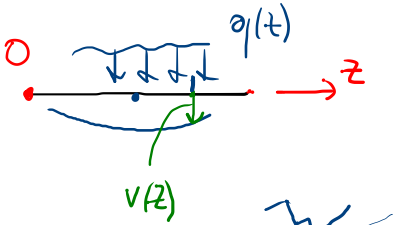


NON SO FARLO CON LA LINEA ELASTICA! SOLO METODO DELLE FORZE.

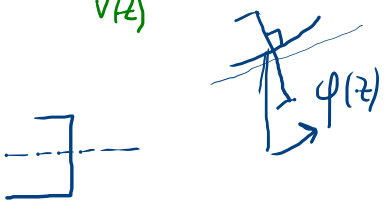
LINEA ELASTICA IV ORDINE PERMETTE DI RISOLVERE TUTTE LE STRUTTURE INFLESSE.

CONCETTI NOTI DELLE TRAVI SNELLE INFLESSE

- EQUILIBRIO (EQ. INDEFINITE) $\frac{dM}{dz} = T$; $\frac{dT}{dz} = -q$



- CONGRUENZA (EQ. CONGRUENZA INTERNA) $\kappa = \frac{d\varphi}{dz}$ $\frac{dv}{dz} = -\varphi$



κ : CURVATURA

- LEGAME COSTITUTIVO ELASTICO $\kappa = \frac{M}{EI}$

$$\frac{M}{EI} = \kappa = -\frac{d^2v}{dz^2} \rightsquigarrow M = -EIv'' \rightsquigarrow M' = -(EIv'')' \rightsquigarrow T = -(EIv'')'$$

$$\rightsquigarrow T' = -(EIv'')'' \rightsquigarrow \boxed{q = (EIv'')''}$$

LINEA ELASTICA II ORDINE

LINEA ELASTICA DEL IV ORDINE

+4 C. LIMITI

SE $EI = cost$: $\boxed{EI\, v''''(z) = q(z)}$

inoltre $T(z) = -EI\, v'''(z)$

$v(0)$

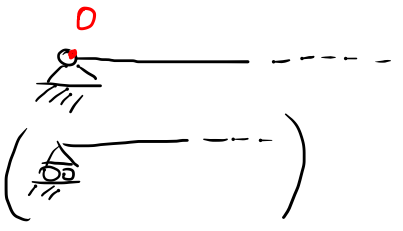
$\varphi(0)$

$-EIv'' = M(0)$

$-EIv''' = T(0)$

C. LIMITI

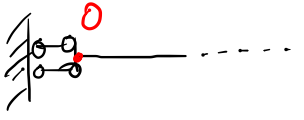
C. AI LIMITI ???



$v(0) = 0$

$-EIv''(0) = 0 \rightarrow v''(0) = 0$

(MOMENTO NULLO)

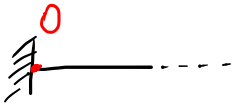


$\varphi(0) = 0$; $-v'(0) = 0$

$T(0) = 0$

$-EIv'''(0) = 0$

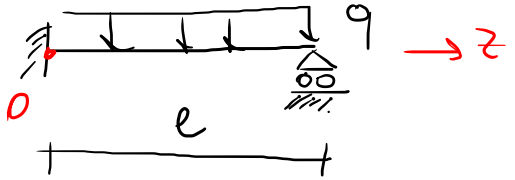
$v'''(0) = 0$



$\begin{bmatrix} v(0) = 0 \\ v'(0) = 0 \end{bmatrix}$

$\begin{bmatrix} v''(0) = 0 \\ v'''(0) = 0 \end{bmatrix}$

ES:



EI cost.

$$v(z) = \frac{q}{EI}\frac{z^4}{24} + C_1\frac{z^3}{6} + C_2\frac{z^2}{2} + C_3 z + C_4$$

$$\begin{cases} EI\, v^{IIII}(z) = q \\ v(0) = 0 \\ v'(0) = 0 \\ v(\ell) = 0 \\ v''(\ell) = 0 \end{cases} \Rightarrow \begin{cases} C_4 = 0 \\ C_3 = 0 \\ \frac{q\ell^4}{24EI} + C_1\frac{\ell^3}{6} + C_2\frac{\ell^2}{2} = 0 \\ \frac{q\ell^2}{2EI} + C_1\ell + C_2 = 0 \end{cases} \Rightarrow \begin{cases} C_1 = -\frac{5}{8}\frac{q\ell}{EI} \\ C_2 = \frac{1}{8}q\frac{\ell^2}{EI} \\ C_3 = 0 \\ C_4 = 0 \end{cases}$$

$$v''' = \frac{q}{EI}z + C_1$$

$$v'' = \frac{q}{EI}\frac{z^2}{2} + C_1 z + C_2$$

$$v' = \frac{q}{EI}\frac{z^3}{6} + C_1\frac{z^2}{2} + C_2 z + C_3$$

$$M = -EI\, v'' = -q\frac{z^2}{2} + \frac{5}{8}q\ell z - \frac{1}{8}q\ell^2$$

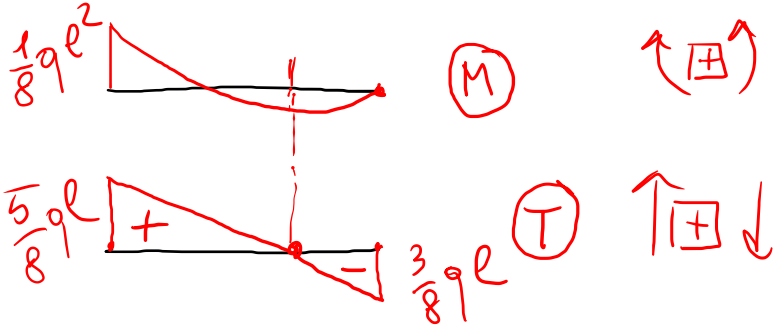
$$M(0) = -\frac{1}{8}q\ell^2$$

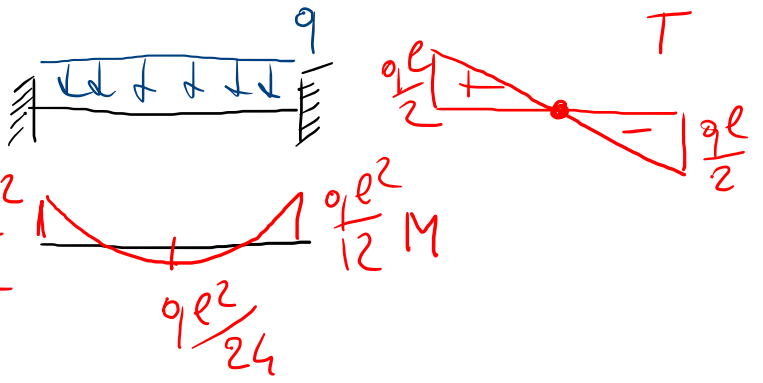
$$M(\ell) = 0$$

$$T = -EI\, v''' = -qz + \frac{5}{8}q\ell$$

$$T(0) = \frac{5}{8}q\ell$$

$$T(\ell) = -\frac{3}{8}q\ell$$

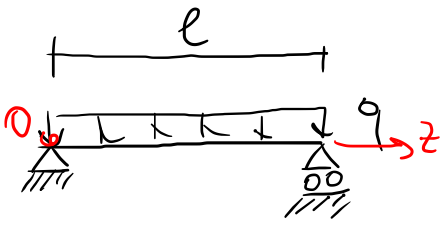




C.DI LIMITE

$v(0) = v'(0) = 0$

$v(\ell) = v'(\ell) = 0$



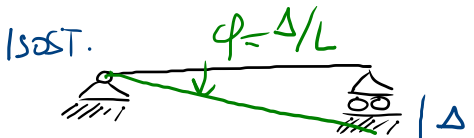
$v'' = -\frac{M}{EI}$

$$\begin{cases} EI\, v^{IIII} = q \\ v(0) = v''(0) = 0 \\ v(\ell) = v''(\ell) = 0 \end{cases}$$

OTTENGO LA STESSA SOLUZ. DI $v'' = -\frac{M(z)}{EI}$

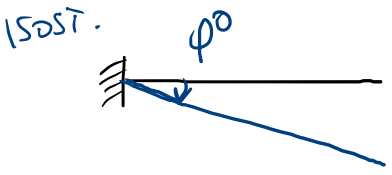
CONDIZ. CON VINCOLI CEDEVOLI

- VINCOLO ANELASTICO.



spost. rigido

No M, No T



Spost. rigido

No M, No T

IPERST.

$M(\eta), T(\eta) \neq 0$

$$\begin{cases} EI\, v^{IIII}(z) = 0 \\ v(0) = v'(0) = 0 \\ v'(\ell) = 0 \\ v(\ell) = \eta \end{cases}$$

$v(z) = f(z^3 \dots)$