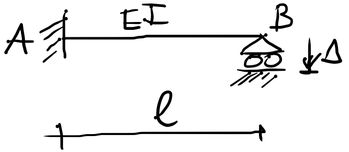
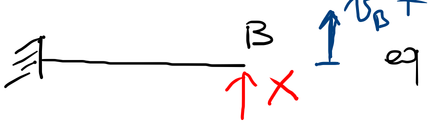
IPERST. CON CEDIM. ANELASTICO

SDC 137IN, 20/12/23



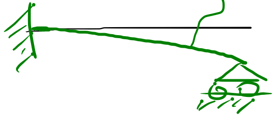
$\Rightarrow$ S.P. 1



eq di congruenza

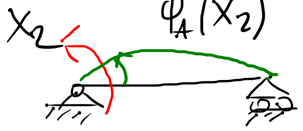
$$v_B = -\Delta$$

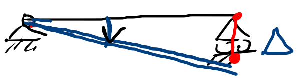
$$M, T = f(\Delta)$$



$$\frac{X \ell^3}{3EI} = -\Delta \Rightarrow X = -\frac{3EI}{\ell^3}\Delta$$

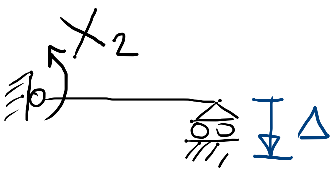
T COSTANTE





CATENA CINEMATICA

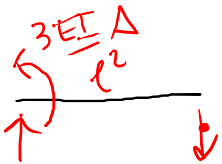
$\Rightarrow$ S.P. 2

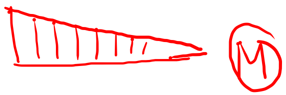


+

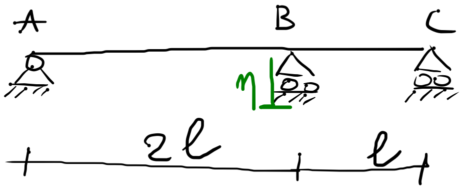
$$\varphi_A = 0$$

$$\varphi_A(X_2) + \varphi_A(\Delta) = 0 \; ; \; \frac{X_2 \ell}{3EI} - \frac{\Delta}{\ell} = 0 \; ; \; X_2 = +\frac{EI\,3}{\ell^2}\Delta$$



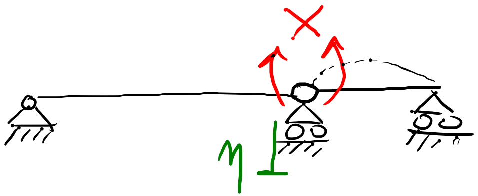


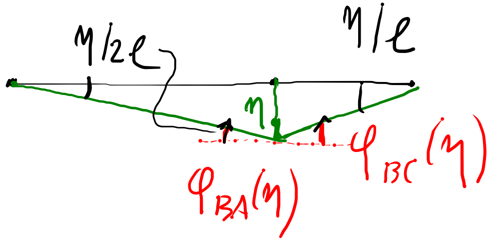
LES

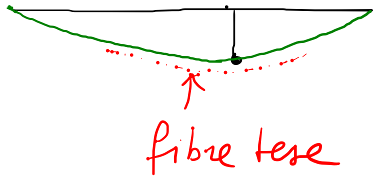


1 V IPERST. $\Rightarrow$ STATO COAZIONE $f(\eta)$

S.P.



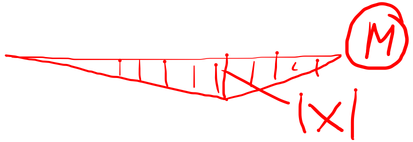




$+\circlearrowright \quad \varphi_{BA} = \varphi_{BC}$

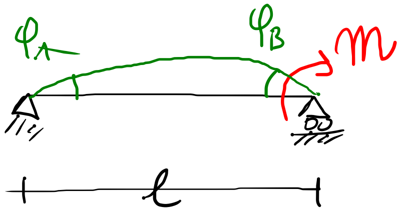
$$\boxed{-\frac{X\,2\ell}{3EI} - \frac{\eta}{2\ell} = \frac{X\ell}{3EI} + \frac{\eta}{\ell}}$$

$\Rightarrow X = X(\eta) \rightarrow M(\eta), T(\eta)$

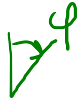


$X < 0$

PREPARAZIONE AL METODO DEGLI SPOSTAMENTI: SCHEMI ELEMENTARI



$$\varphi_A = \frac{m\ell}{6EI} \; ; \; \varphi_B = \frac{m\ell}{3EI}$$



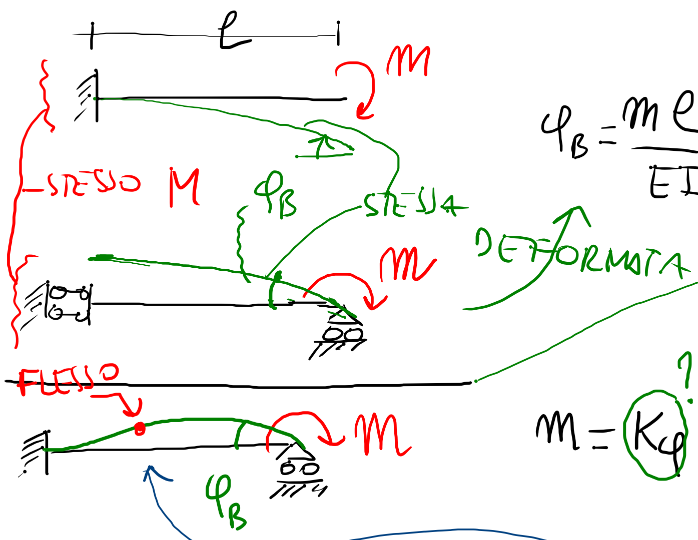
RIGIDEZZA ROTAZIONALE

$$m = K_\varphi \, \varphi$$

$$[FL] = [FL][-]$$

Nm

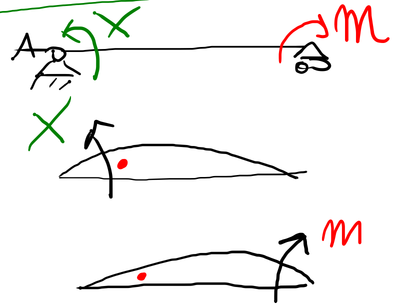
$$\boxed{m = \underbrace{\frac{3EI}{\ell}}_{K_\varphi} \varphi_B}$$



$$\varphi_B = \frac{m\ell}{EI}$$

$$\boxed{m = \underbrace{\frac{EI}{\ell}}_{K_\varphi} \varphi_B}$$

$$m = K_\varphi \; ? \; \varphi_B$$



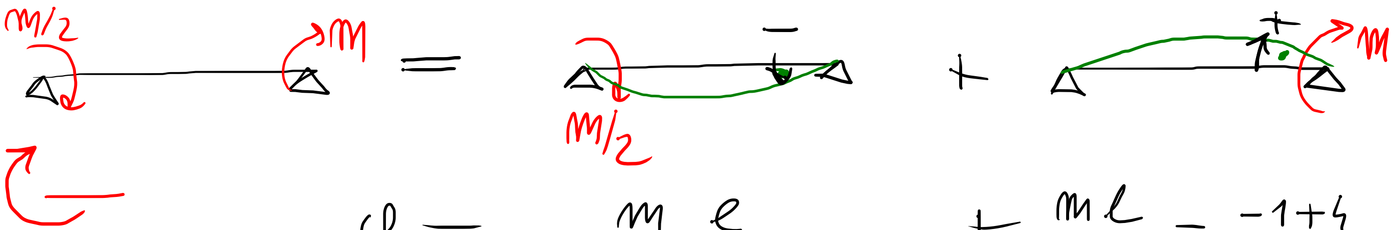
$$\varphi_A = 0$$

$$+\frac{X\cancel{\ell}}{3\cancel{EI}} + \frac{m\cancel{\ell}}{6\cancel{EI}} = 0$$

$$X = -\frac{m}{2}$$

SCL EQUILIBRIO e CONGRUENTE

φ_B ?

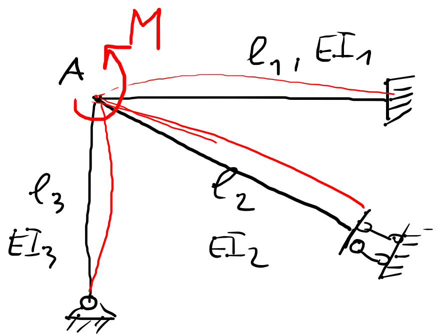


$$\varphi_B = -\frac{M}{2}\frac{l}{6EI} + \frac{Ml}{3EI} = \frac{-1+4}{12} = +\frac{Ml}{4EI}$$

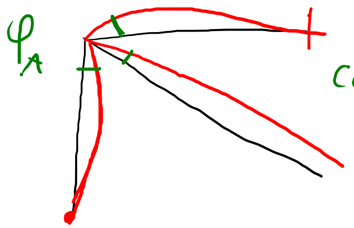
$$M = \overbrace{\frac{4EI}{l}}^{K_\varphi}\varphi_B$$

METODO DEGLI SPOSTAMENTI (DELL'EQUILIBRIO)
FORZE (DELLA CONGRUENZA)

TELAIO AD UN NODO FISSO



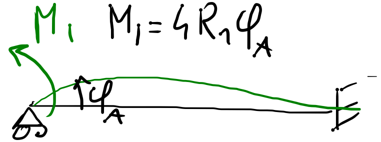
φ_A: ROTAZ. ELASTICA DEL NODO: INCOGNITA



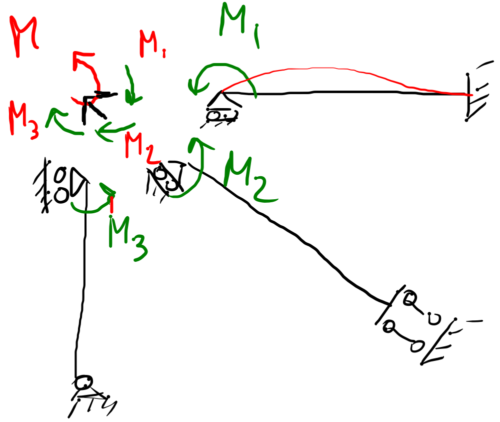
φ_A è COMUNE A TUTTE LE TRAVI DEL NODO

|||

CONGRUENZA



$M_1 = 4 R_1 \varphi_A$ $\qquad \left(\frac{EI}{\ell}\right)_1 = R_1$



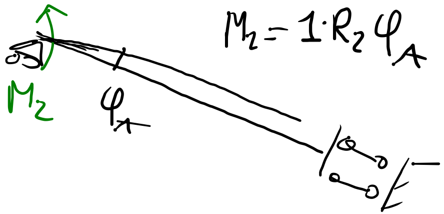
EQ. EQUILIBRIO DEL NODO A: $\curvearrowright +$

$$M_1 + M_2 + M_3 - M = 0$$

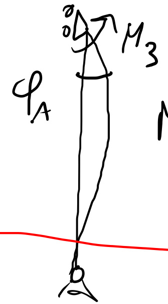
$$4 R_1 \varphi_A + R_2 \varphi_A + 3 R_3 \varphi_A = M$$

φ_A: INCOGNITA

$$\varphi_A (4 R_1 + R_2 + 3 R_3) = M \longrightarrow \varphi_A = \varphi_A(M)$$



$M_2 = 1 \cdot R_2 \varphi_A$



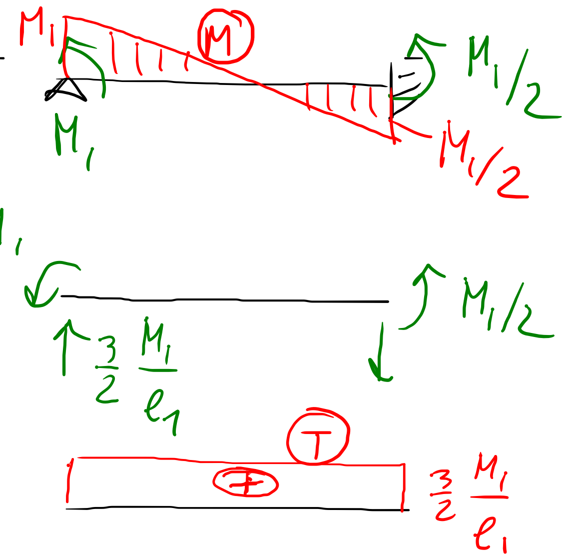
$M_3 = 3 \cdot R_3 \varphi_A$

NOTO φ_A $\longrightarrow$ $M_1 = 4R_1 \dfrac{M}{\sum_{i=1}^{3} c_i R_i}$ φ_A

$M_2 = R_2 \dfrac{M}{\sum_i c_i R_i}$

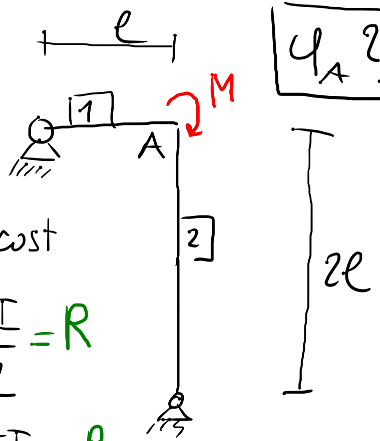
$M_3 = 3R_3 \dfrac{M}{\sum_i c_i R_i}$

$c_1 = 4,\ c_2 = 1,\ c_3 = 3$



ES

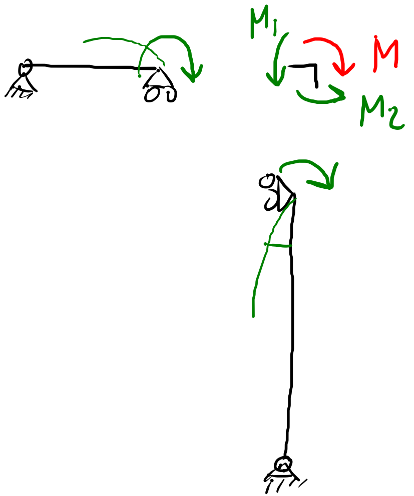
$\boxed{\varphi_A\ ?}$



EI cost

$R_1 = \frac{EI}{l} = R$

$R_2 = \frac{EI}{2l} = \frac{R}{2}$



EQUILIBRIO $(\circlearrowright +)$: $M - M_1 - M_2 = 0$

$$M = M_1 + M_2 = 3R_1\varphi_A + 3R_2\varphi_A$$

$$\varphi_A = \frac{M}{3R_1+3R_2} = \frac{M}{3R+\frac{3}{2}R} = \frac{M}{R}\,\frac{1}{\frac{6+3}{2}} = \frac{M}{R}\,\frac{2}{9}$$

$$M_1 = 3R\varphi_A = 3R\,\frac{2}{9}\,\frac{M}{R} = \boxed{\frac{6}{9}M}$$

$$M_2 = 3\frac{R}{2}\varphi_A = \frac{3}{2}R\,\frac{2}{9}\,\frac{M}{R} = \boxed{\frac{3}{9}M}$$

$$\overline{}$$
$$M$$

VISTO CHE $R_2 = \frac{R_1}{2}$ e $c_1 = c_2 = 3 \Rightarrow$

$$\Rightarrow M_2 = \frac{M_1}{2}$$

LE TRAVI PIÙ "RIGIDE" NEL NODO ASSORBONO UN'ALIQUOTA MAGGIORE DI MOMENTO

EQUIL. COMPLETO DEL NODO
ANCHE CON TAGLI e FORZE NORMALI
DELLE TRAVI CORRISPONDENTI