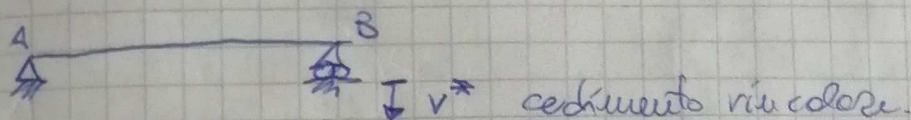


Esercizio



$$\frac{d^4 v}{dx^4} = 0 \quad v(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3$$

$$x=0 \quad \begin{aligned} v(0) &= 0 & a_0 &= 0 \\ \varphi(0) &= 0 & a_2 &= 0 \end{aligned}$$

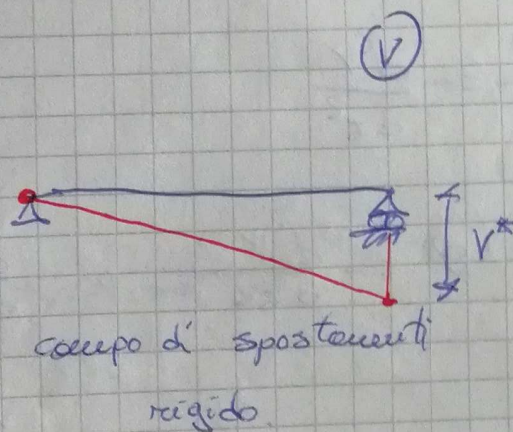
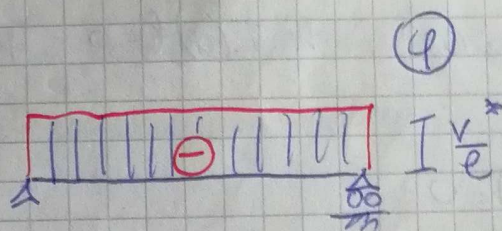
$$x=l \quad \begin{aligned} v(l) &= v^* & a_1 l + a_3 l^3 &= v^* & a_1 &= \frac{v^*}{l} \\ M(l) &= 0 & -EI a_3 l &= 0 & a_3 &= 0 \end{aligned}$$

$$v(x) = \frac{v^*}{l} x$$

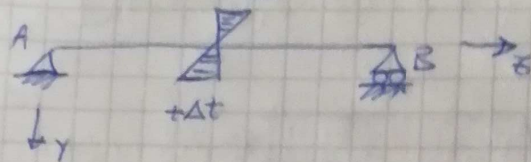
$$\varphi(x) = -\frac{v^*}{l}$$

$$M(x) = 0$$

$$T(x) = 0$$



20/05/2009



$$\left\{ \begin{array}{l} \frac{dT}{dx} + q = 0 \\ \frac{dM}{dx} - T + \phi = 0 \end{array} \right. \quad \left\{ \begin{array}{l} \theta + \theta^* = \frac{d\phi}{dx} \\ \frac{dV}{dx} + q = 0 \end{array} \right. \quad \left\{ \begin{array}{l} \theta = \frac{\eta}{EI} \end{array} \right.$$

$$T(x) = \cos t = T(0)$$

$$M(x) = M(0) + \frac{1}{2} T(0) x$$

condizioni al contorno

$$M(0) = 0$$

$$M(l) = 0 \quad \rightarrow T(0)l = 0 \quad \rightarrow T_0 = 0$$

$$T(x) = 0$$

$$M(x) = 0$$

$$\frac{d\phi}{dx} = -\frac{d^2 V}{dx^2}$$

$$\frac{M}{EI} + \theta^* = -\frac{d^2 V}{dx^2}$$

$$\frac{dV}{dx} = -\theta^* x + C_1$$

$$V(x) = -\frac{\theta^* x^2}{2} + C_1 x + C_2$$

condizioni al contorno

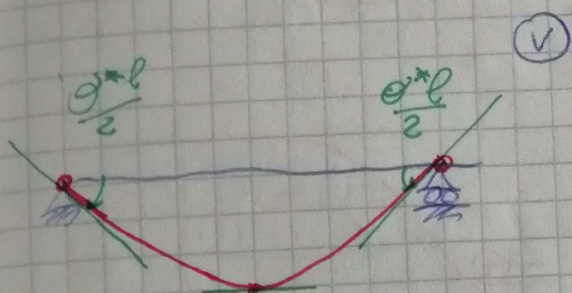
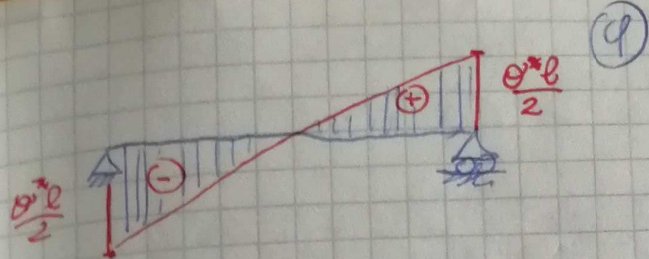
$$V(0) = 0 \quad \rightarrow C_2 = 0$$

$$V(l) = 0 \quad \rightarrow -\frac{\theta^* l^2}{2} + C_1 l = 0$$

$$\rightarrow C_1 = \frac{\theta^* l}{2}$$

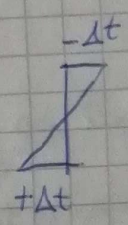
$$V(x) = -\theta^* \frac{x^2}{2} + \frac{\theta^* l}{2} x$$

$$\phi(x) = \theta^* x - \frac{\theta^* l}{2} x$$

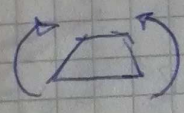


$$v(l/2) = \frac{q^* l^2}{8}$$

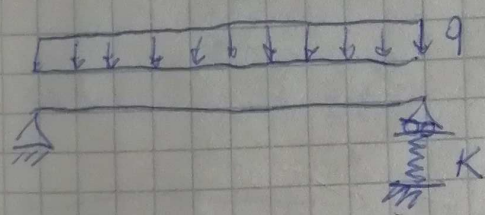
$$q^* = 2 \alpha \frac{\Delta t}{h}$$



q^* è positive perché dà la stessa deformazione di momenti positivi



Esercizio



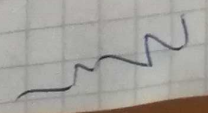
$$v(l) = -\frac{R}{K}$$

$$\frac{d^4 v}{dx^4} = \frac{q}{EI}$$

$$v(x) = \left(a_0 + a_1 x + a_2 x^2 + a_3 x^3 \right) + \frac{q x^4}{24 EI}$$

$$\begin{cases} v(0) = 0 & \Rightarrow a_0 = 0 \\ M(0) = 0 & \Rightarrow a_2 = 0 \end{cases}$$

$$\begin{cases} v(l) = -\frac{R}{K} = -\frac{T(l)}{K} \\ \theta(l) = 0 \end{cases}$$



$$\varphi(x) = -a_1 - 3a_3x^2 - \frac{qx^3}{6EI}$$

$$M(x) = EI(-6a_3x - \frac{qx^2}{2EI})$$

$$T(x) = EI(-6a_3 - \frac{qx}{EI})$$

$$v(l) = -\frac{\pi(l)}{K}$$

↓

$$a_1l + a_3l^3 + \frac{ql^4}{24EI} = -\frac{1}{K} \left[EI(-6a_3 - \frac{ql}{EI}) \right]$$

$$6a_3l + \frac{ql^2}{2EI} = 0 \quad \Rightarrow \quad a_3 = -\frac{ql}{12EI}$$

$$a_1 = \frac{q}{2K} + \frac{ql^3}{24EI}$$

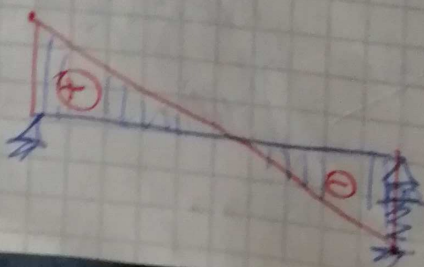
$$v(x) = \left(\frac{q}{2K} + \frac{ql^3}{24EI} \right) x - \frac{ql}{12EI} x^3 + \frac{qx^4}{24EI}$$

$$\varphi(x) = -\left(\frac{q}{2K} + \frac{ql^3}{24EI} \right) + \frac{ql}{4EI} x^2 - \frac{qx^3}{6EI}$$

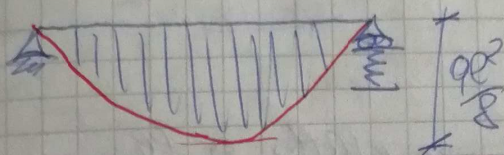
$$M(x) = EI \left(\frac{ql}{2EI} x - \frac{qx^2}{2EI} \right) = \frac{qlx}{2} - \frac{qx^2}{2}$$

$$T(x) = \frac{ql}{2} - qx$$

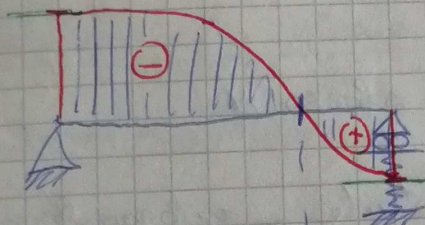
⑦



(11)



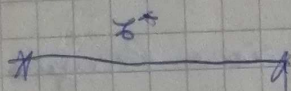
(12)



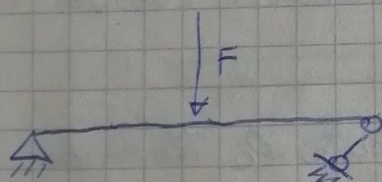
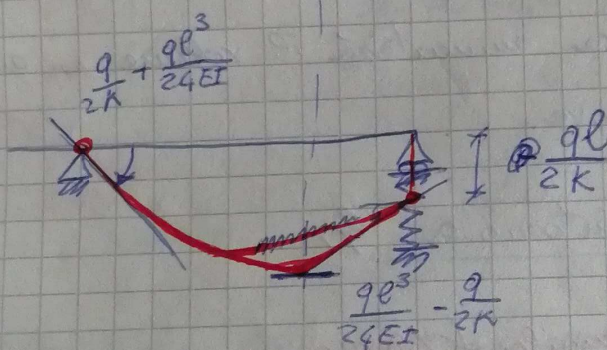
$$-\varphi_A = \varphi_B = \frac{q l^3}{24 E I}$$

$$\varphi(0) = -\frac{q}{2K} - \frac{q l^3}{24 E I}$$

$$\varphi(l) = -\frac{q}{2K} + \frac{q l^3}{24 E I}$$



(13)



il problema estensionale ~~non~~
non è dissociabile con il
problema flessionale

$$\left\{ \frac{d^4 v}{dx^4} = \frac{q}{EI} \right\}$$

$$\left\{ \frac{dN}{dx} + p = 0 \right.$$

$$\left\{ \varepsilon = \frac{dw}{dx} \right.$$

$$\left\{ \varepsilon = \frac{N}{EA} \right.$$

$$\frac{dw}{dx} = \frac{N}{EA}$$

$$\Rightarrow \frac{d^2 w}{dx^2} = \frac{1}{EA} \frac{dN}{dx}$$

$$\left\{ \frac{d^2 w}{dx^2} = \frac{P}{EA} \right.$$