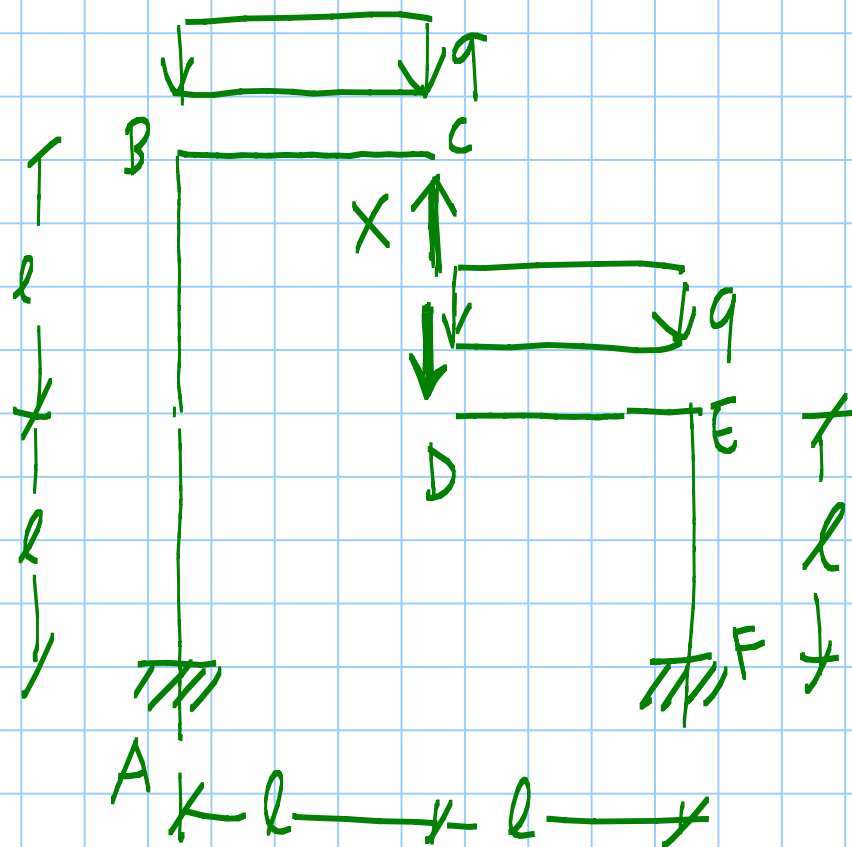
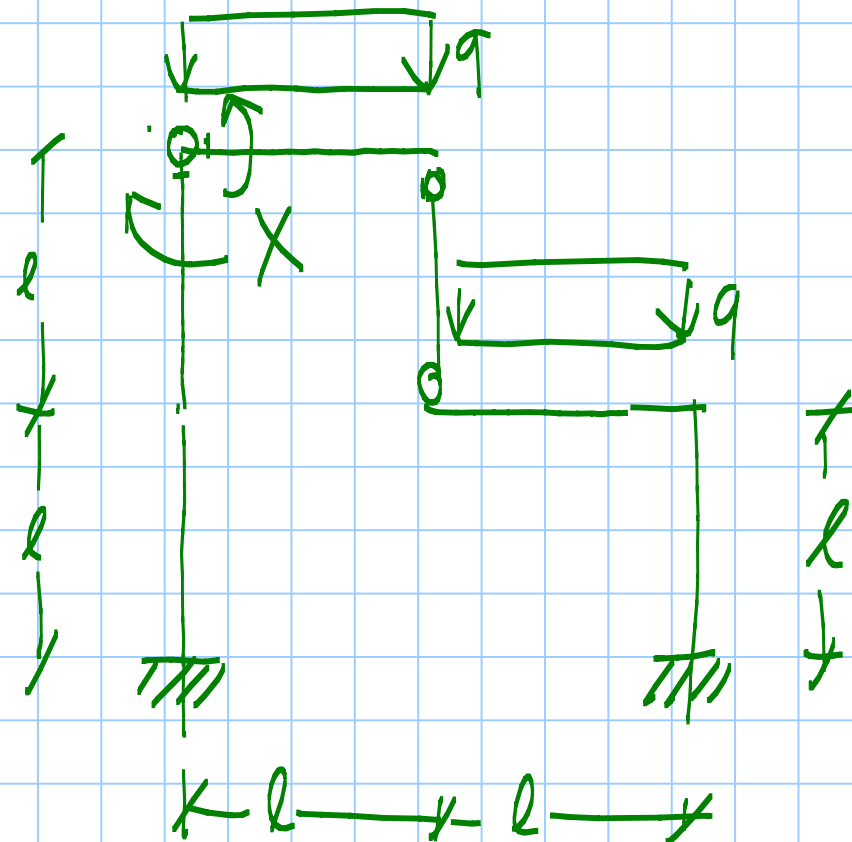


1 volta iperstatica

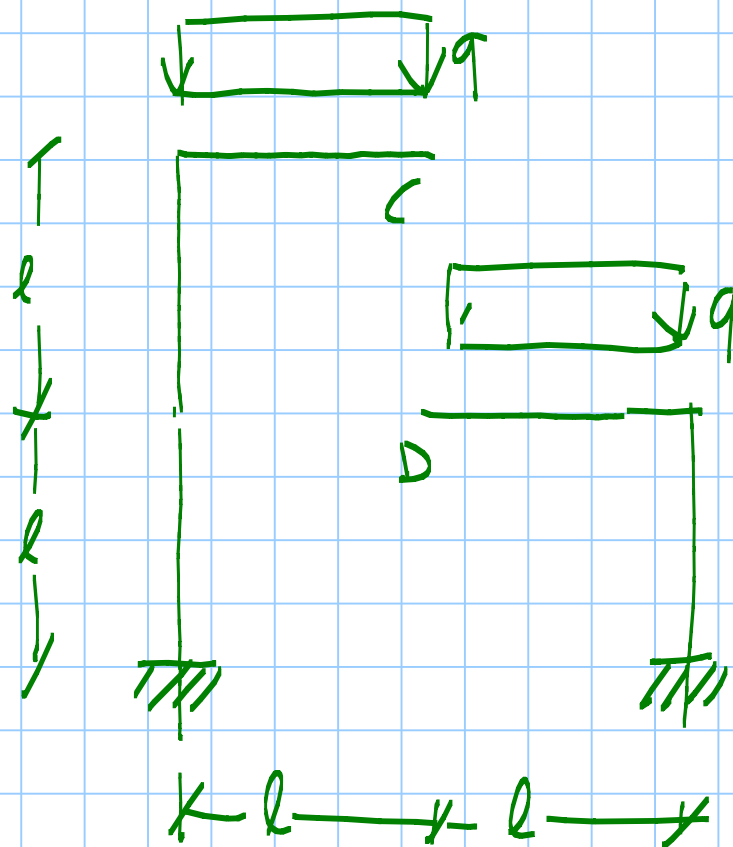
CD  $EA \rightarrow \infty$



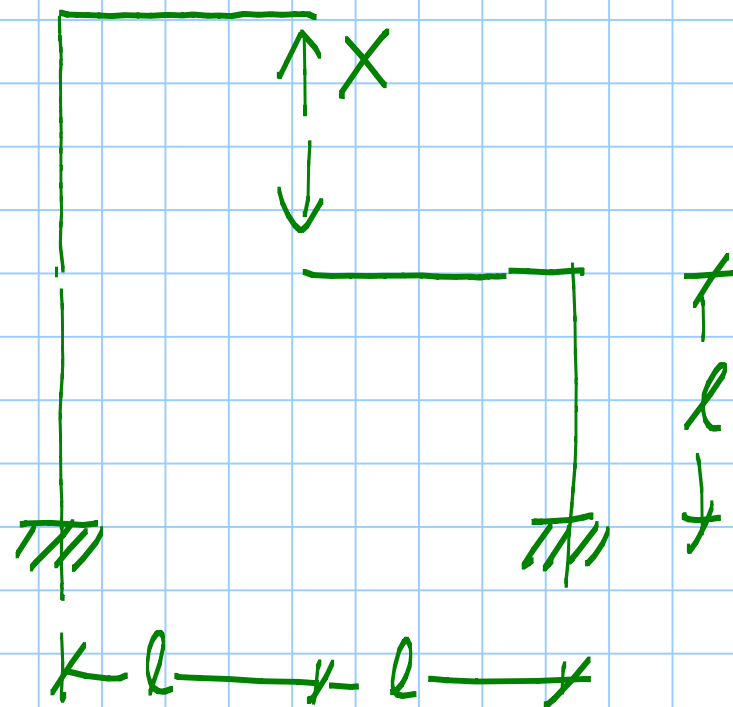
(a)



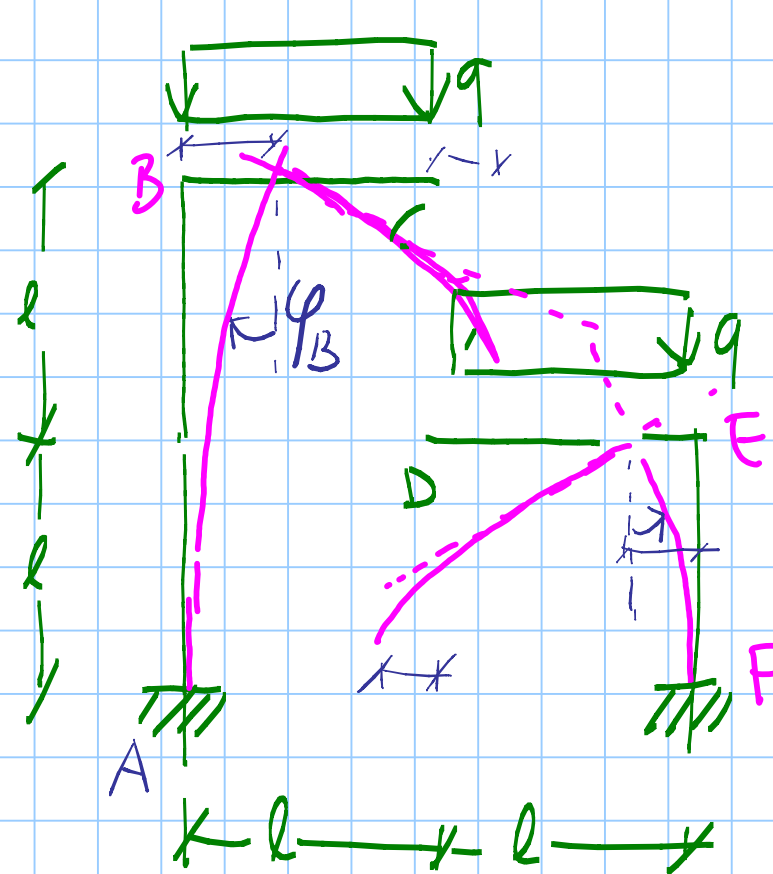
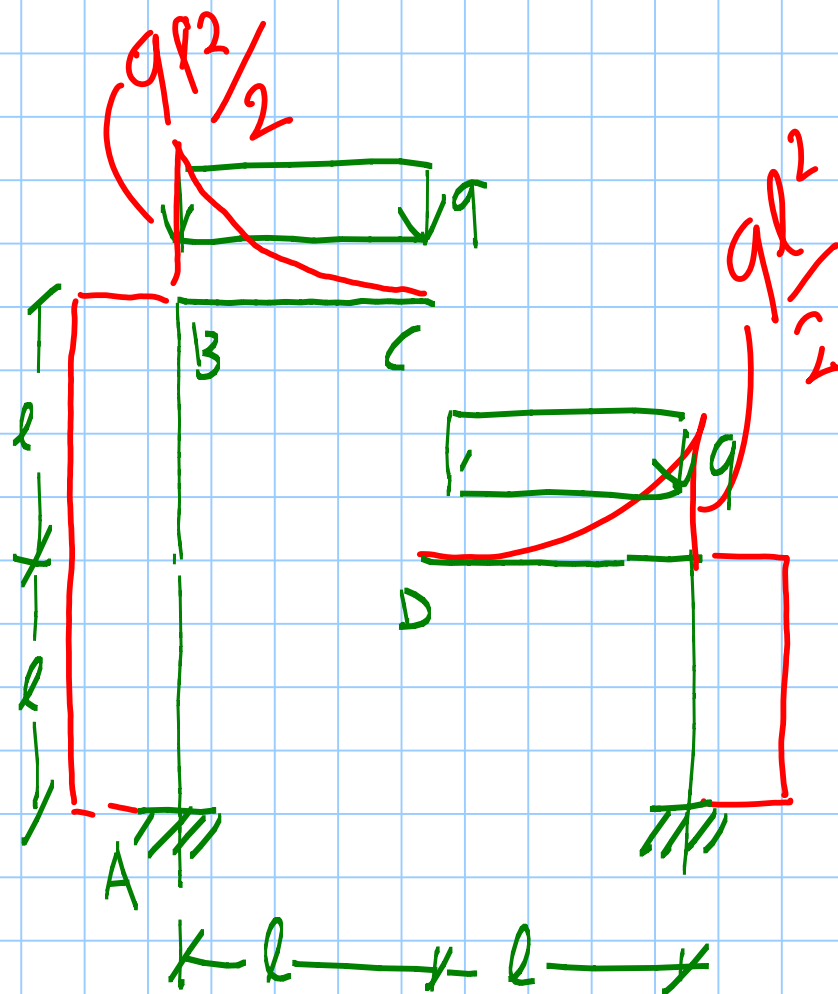
(b)



CONDIZ. CONGRUENZA

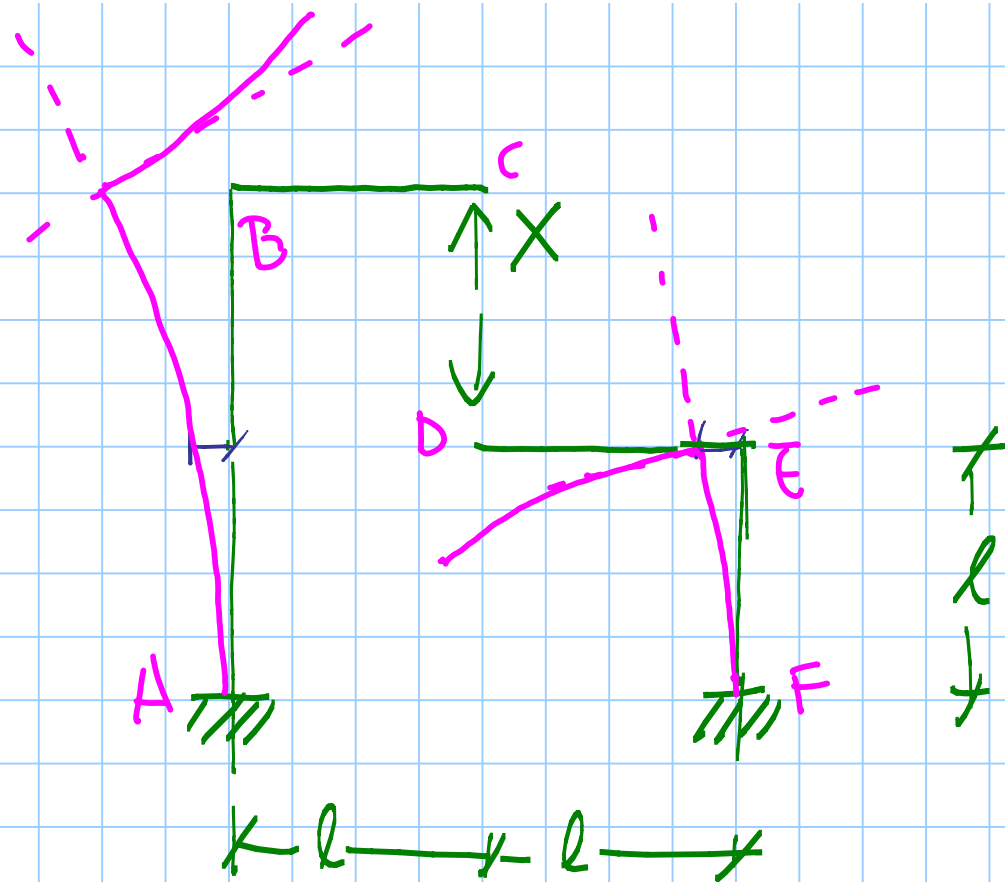
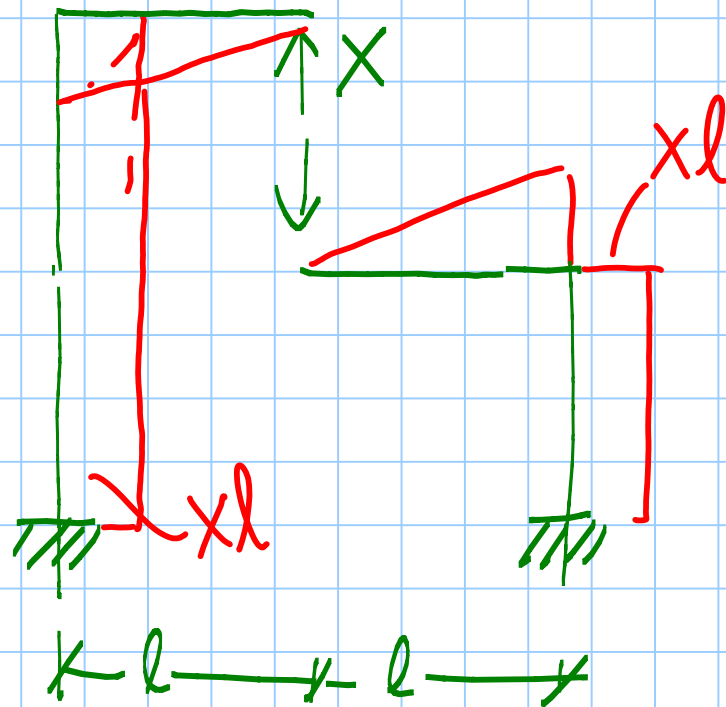


$$V_C = V_D$$

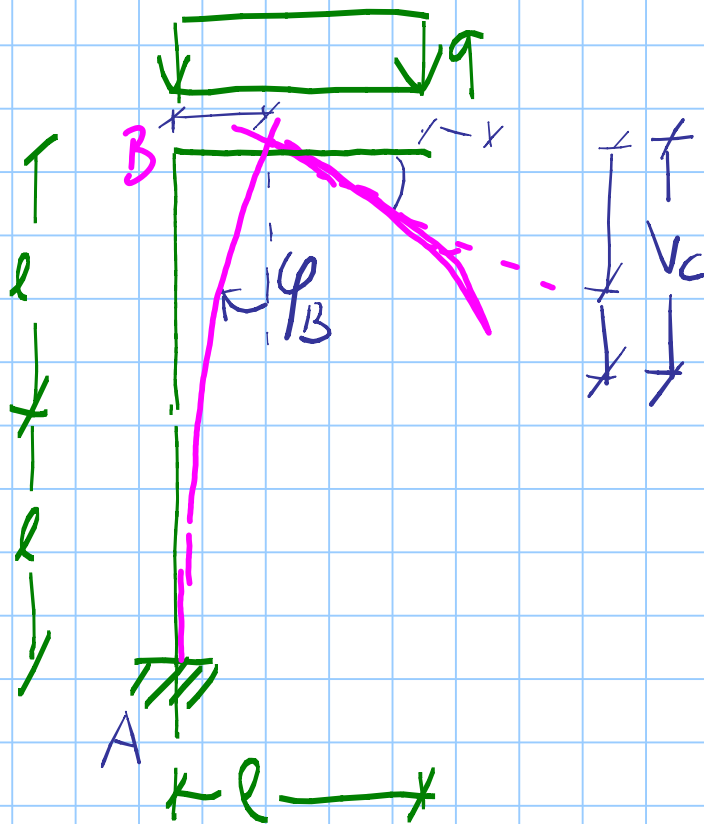


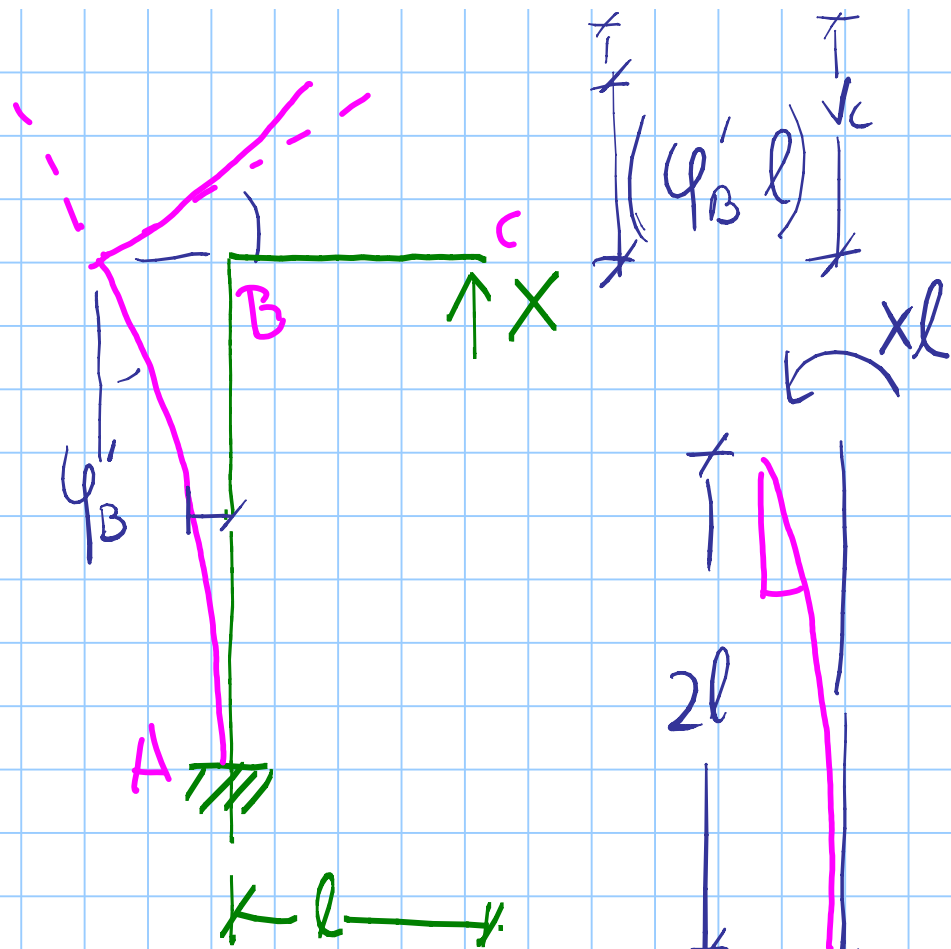
$$\varphi_B = -\frac{m(2l)}{EI} \quad \varphi_E = \frac{ml}{EI}$$

$$\text{con } m = \frac{ql^2}{2}$$

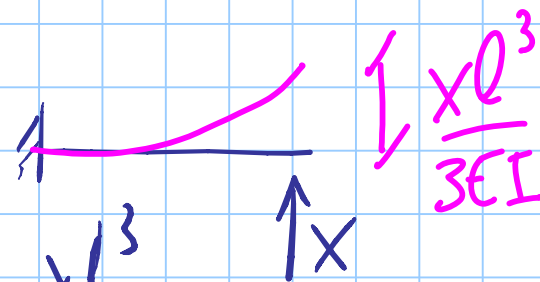
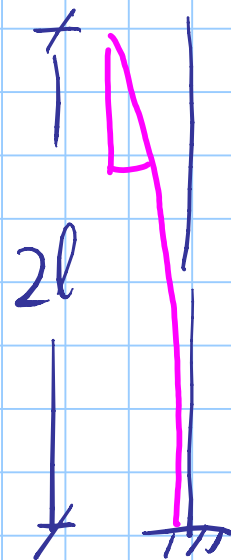


$$v_c = \varphi_B l + \frac{ql^4}{8EI} = \frac{ql^2}{2} \frac{2l}{EI} l + \frac{ql^4}{8EI} = \frac{q}{8} \frac{ql^4}{EI}$$





$$\varphi'_B = \frac{m(2l)}{EI} = \frac{2Xl^2}{EI}$$



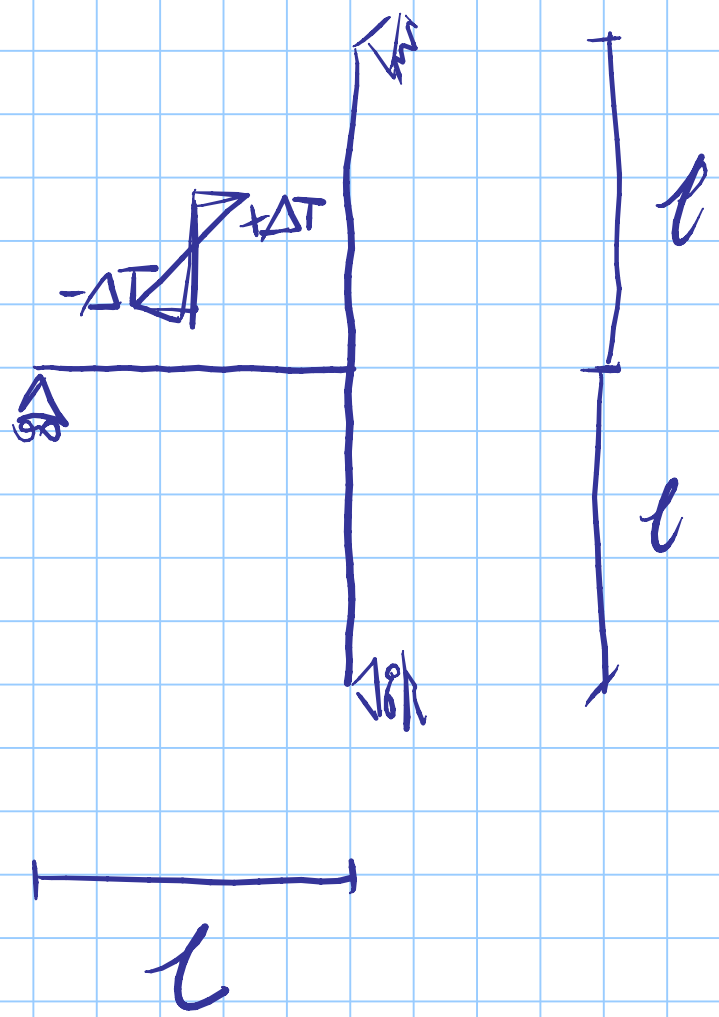
$$v_c = \varphi'_B l + \frac{Xl^3}{3EI} = \frac{2Xl^3}{EI} + \frac{Xl^3}{3EI} = \frac{7}{3} \frac{Xl^3}{EI}$$

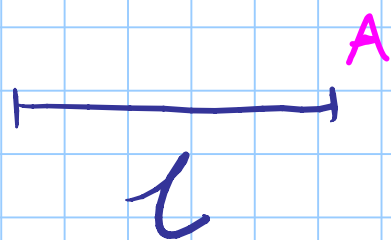
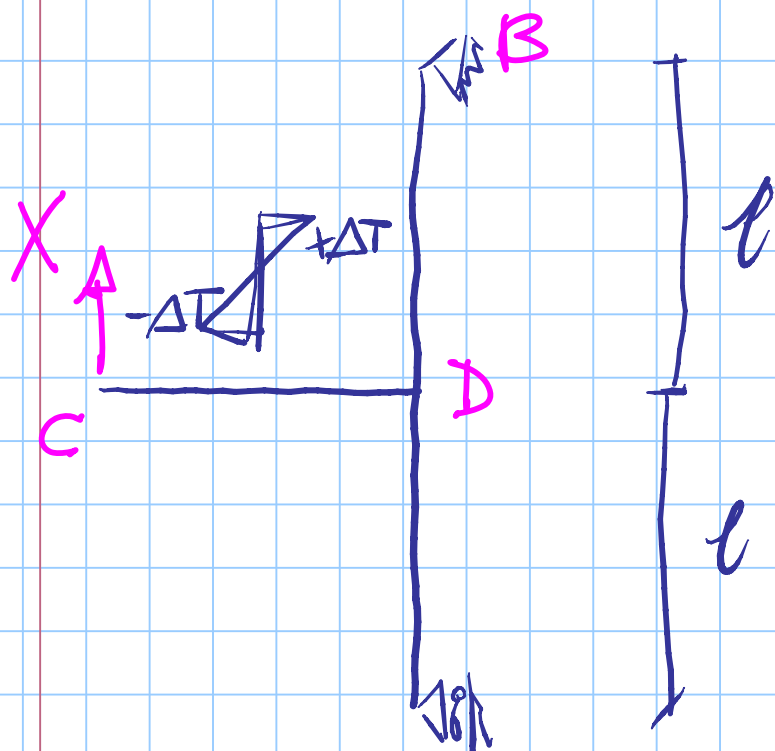
Calcolare  $V_D$

Imporre la cond. congr.  $V_C = V_D \Rightarrow \textcircled{X}$

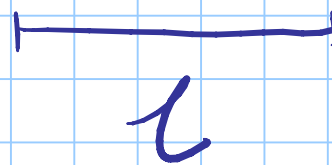
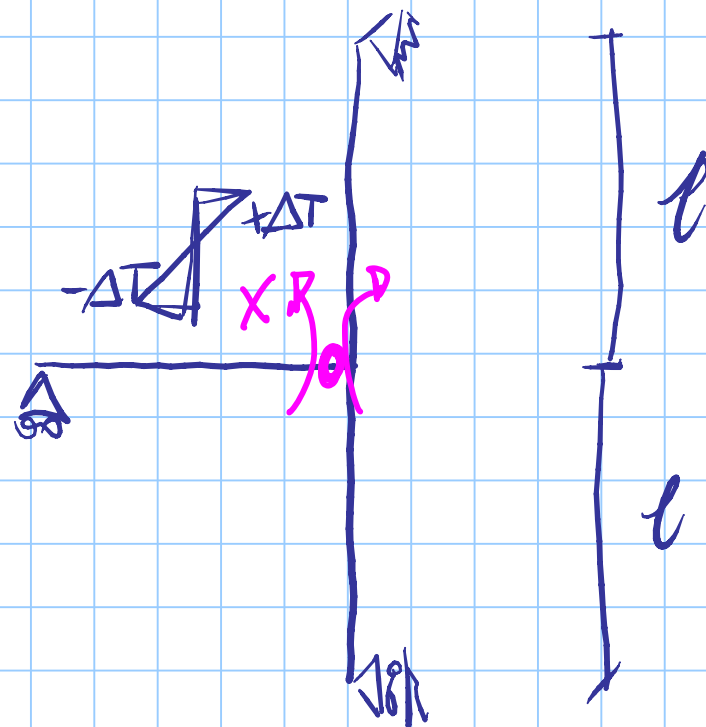
Ricavare  $X = \frac{3}{22} q l$



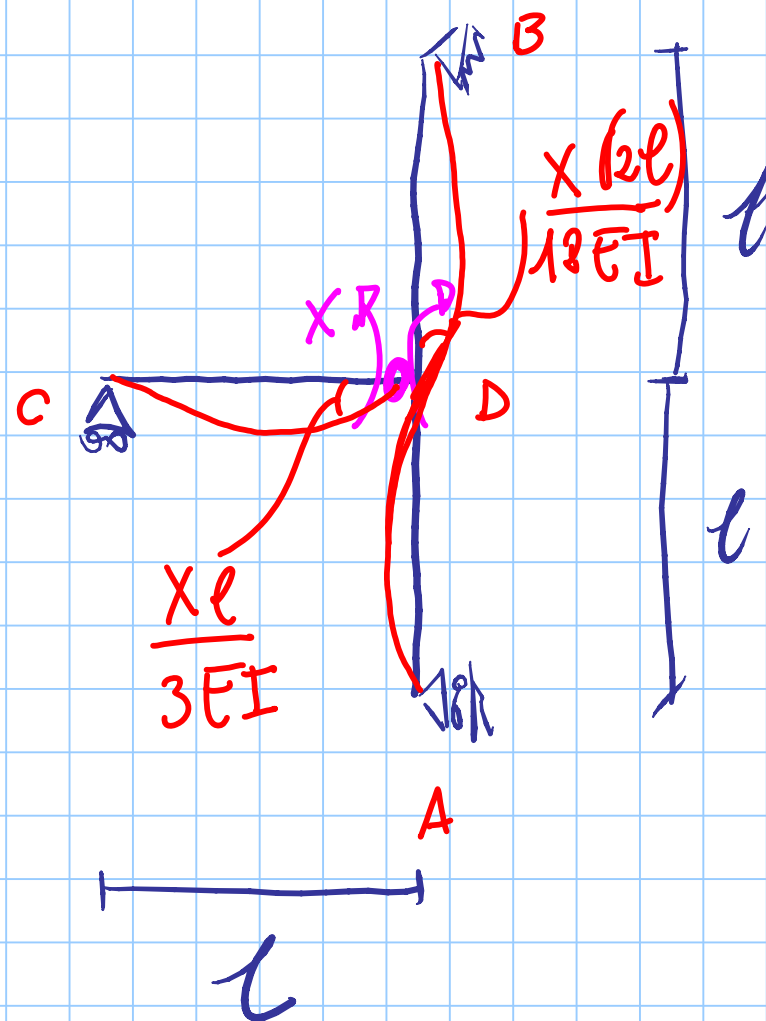
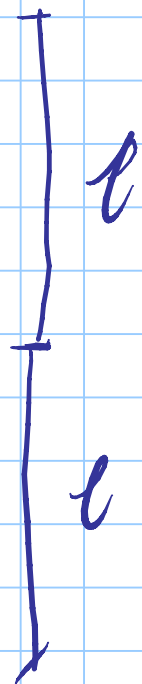
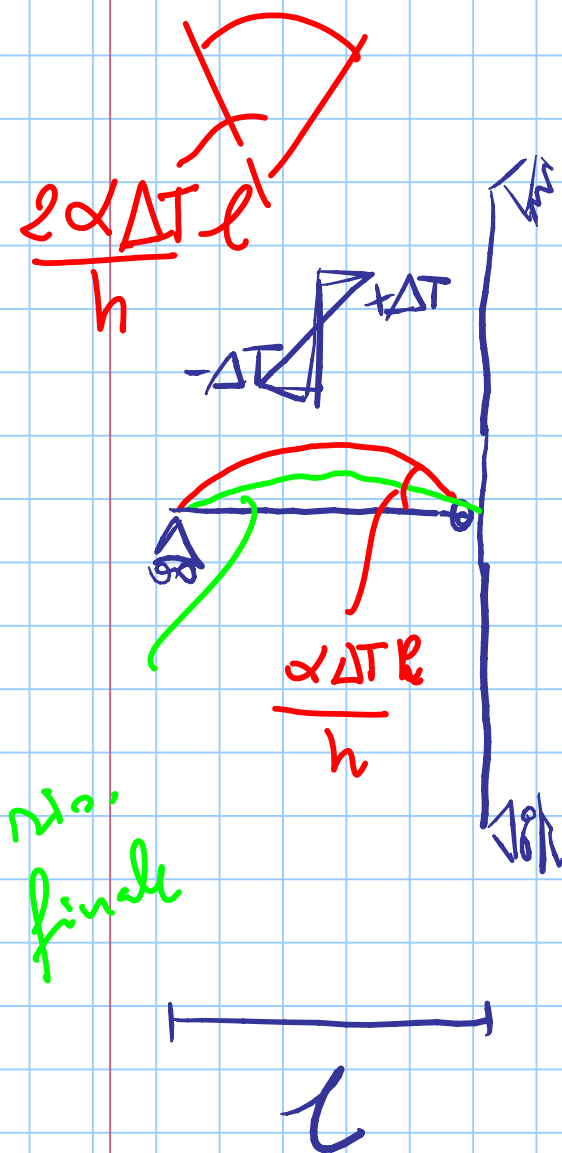


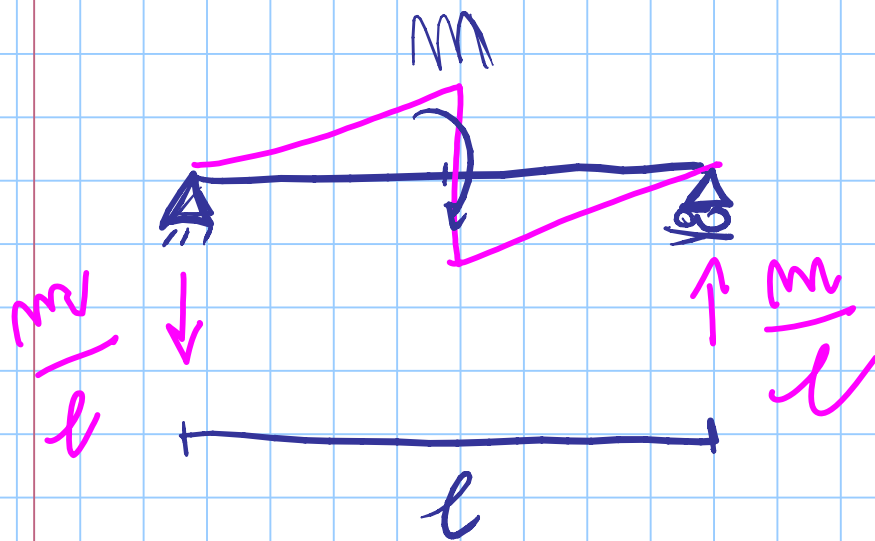


$$V_C = 0$$



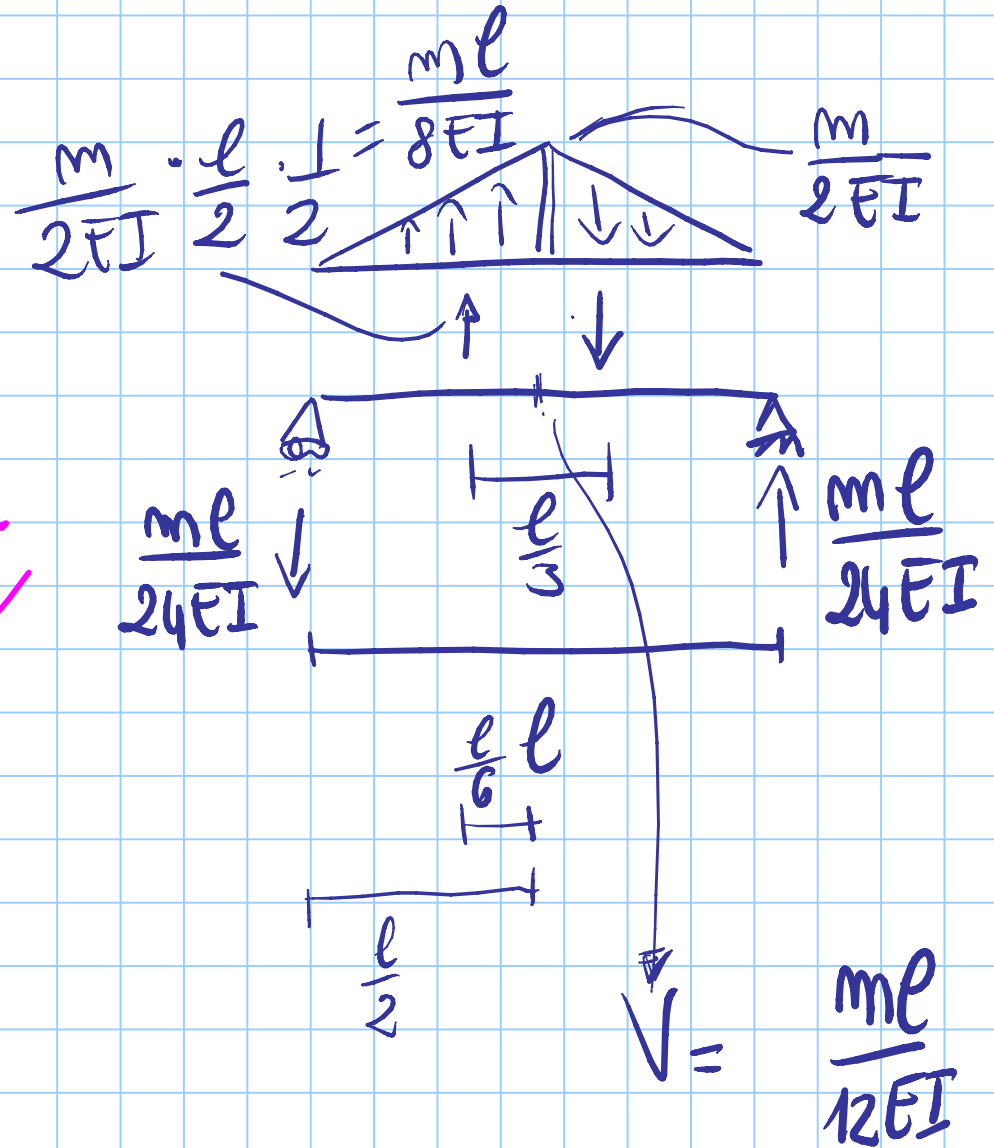
$$\varphi_{DC} = \varphi_{DA} = \varphi_{DB}$$

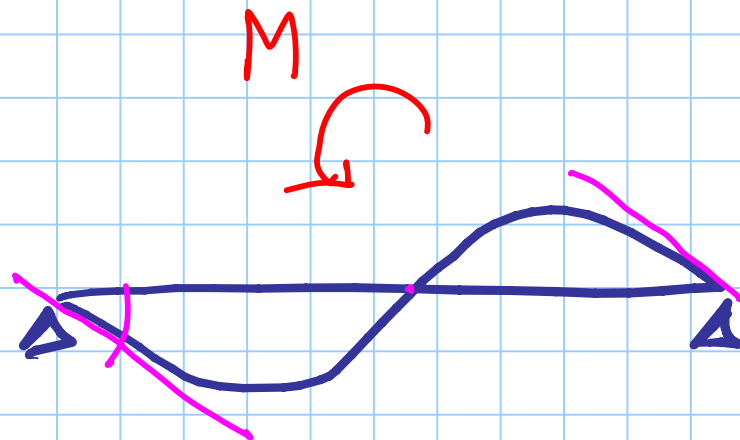




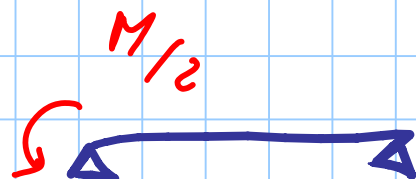
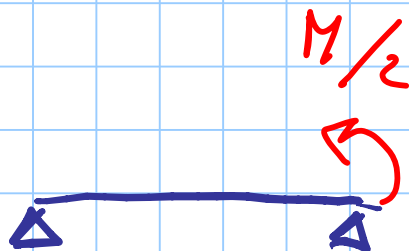
$$\frac{m \cdot l}{8EI} \cdot \frac{l}{3} = l \cdot X$$

$$X = \frac{m \cdot l}{24EI}$$





$$\varphi = \frac{Ml}{2EI}$$



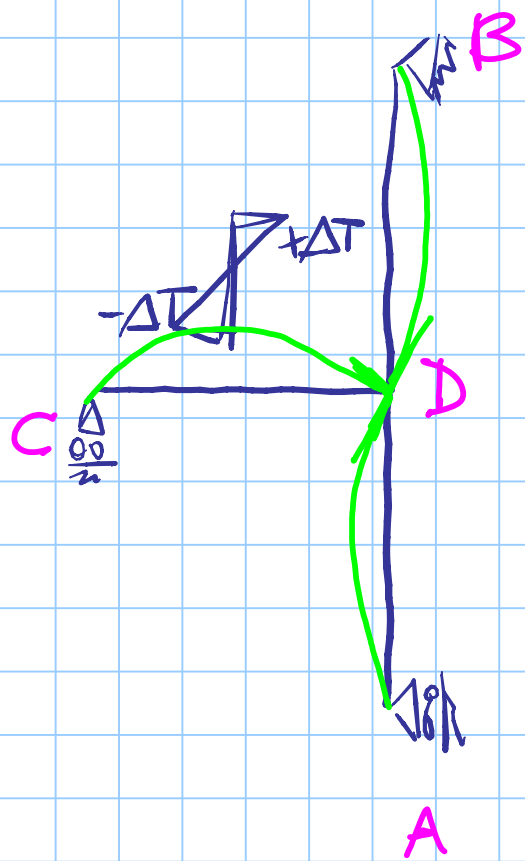
$$\varphi_{DC} = -\frac{\alpha \Delta T \ell}{h} + \frac{X \ell}{3EI} = -\frac{\alpha \Delta T \ell}{h} + \frac{2\alpha \Delta T \cancel{EI}}{h} \cdot \frac{\ell}{\cancel{3EI}} =$$

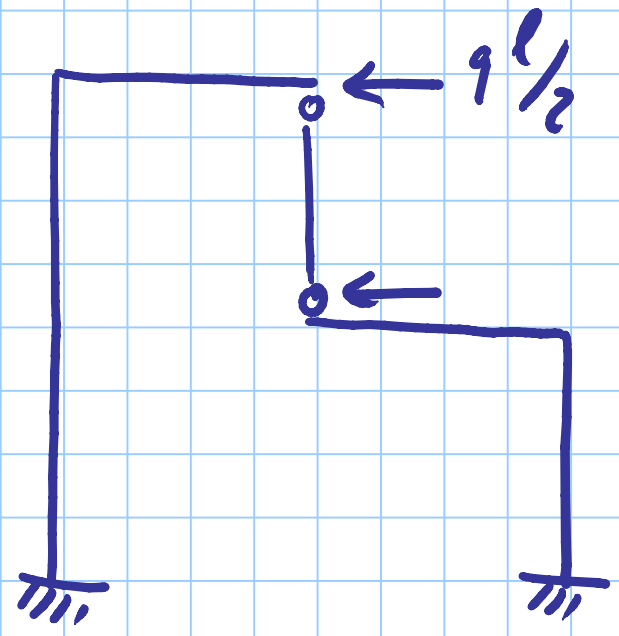
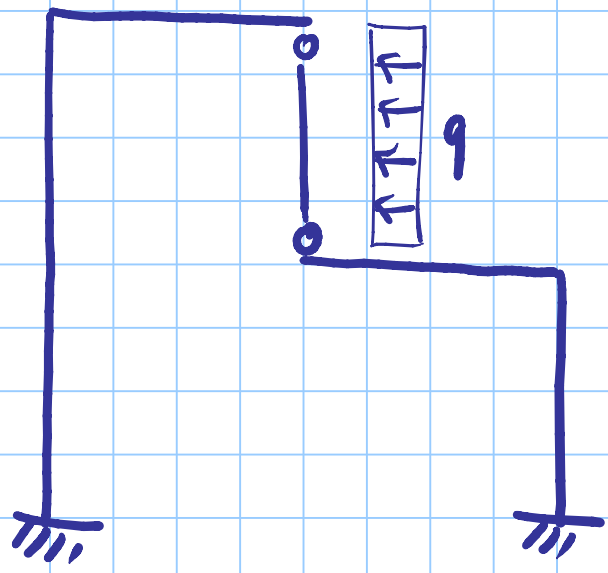
$$\varphi_{DA} = \varphi_{DB} = -\frac{X \ell}{6EI} = \left(-1 + \frac{2}{3}\right) \frac{\alpha \Delta T \ell}{h} = -\frac{1}{3} \frac{\alpha \Delta T \ell}{h}$$



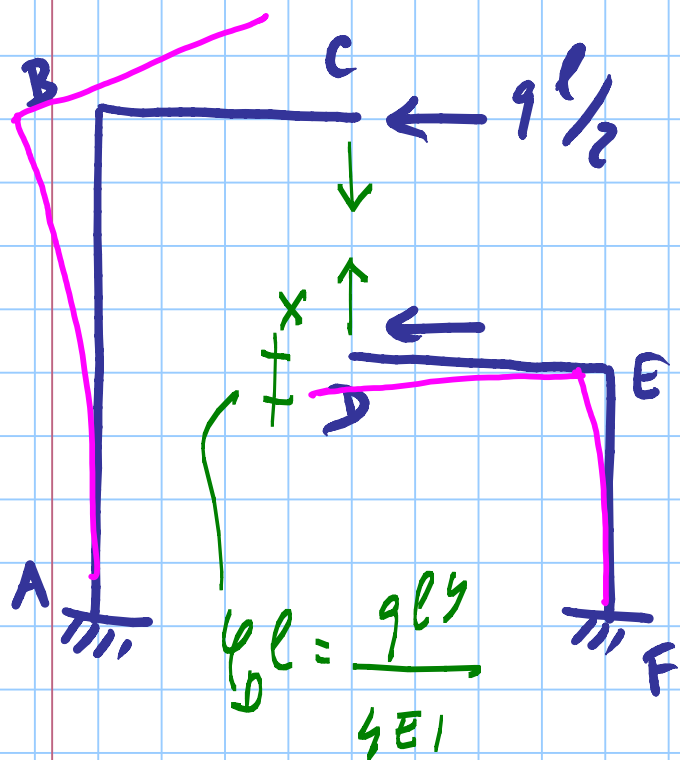
$$-\frac{\alpha \Delta T \ell}{h} + \frac{X \ell}{3EI} = -\frac{X \ell}{6EI}$$

$$\left(\frac{1}{3} + \frac{1}{6}\right) \frac{X}{EI} = \frac{\alpha \Delta T}{h} \Rightarrow X = 2 \frac{\alpha \Delta T \cdot EI}{h}$$

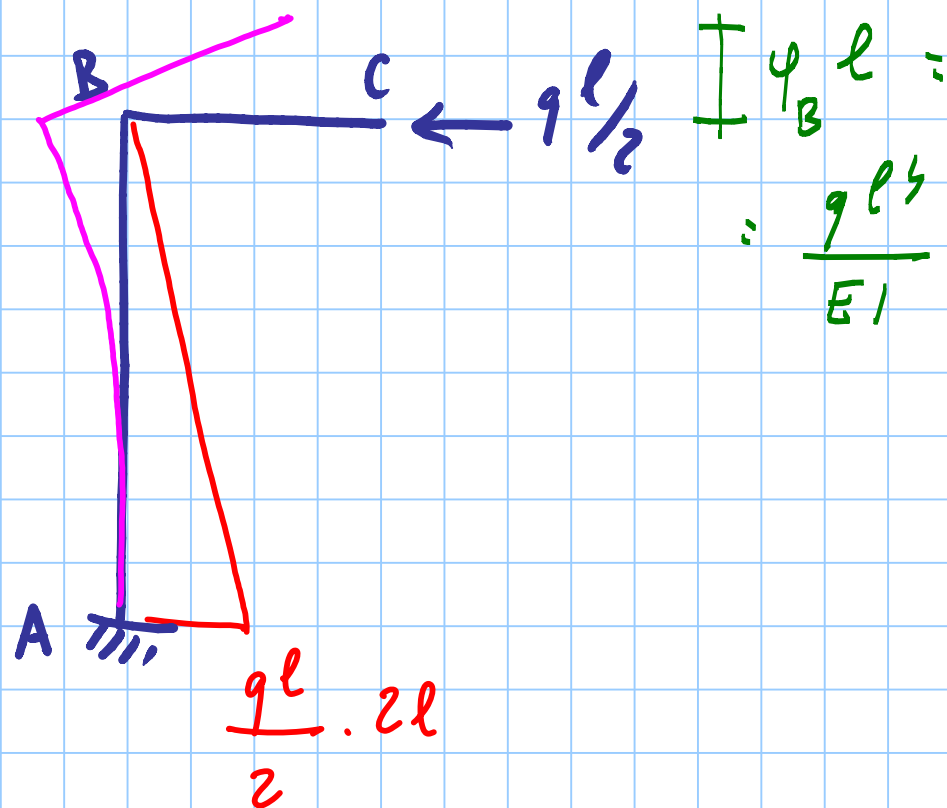




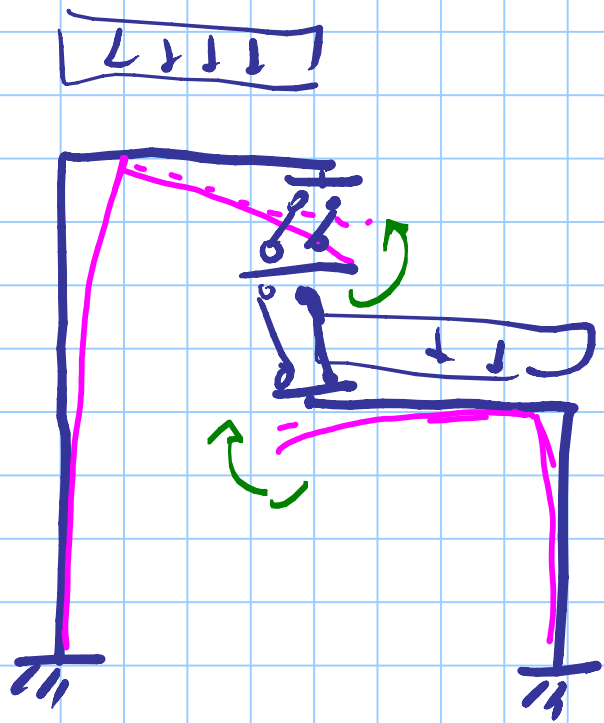


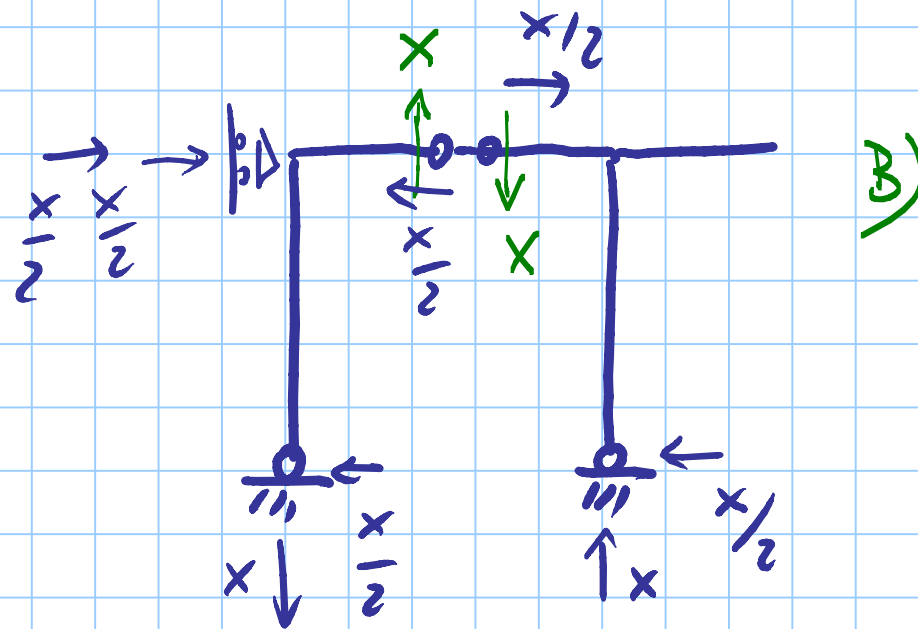
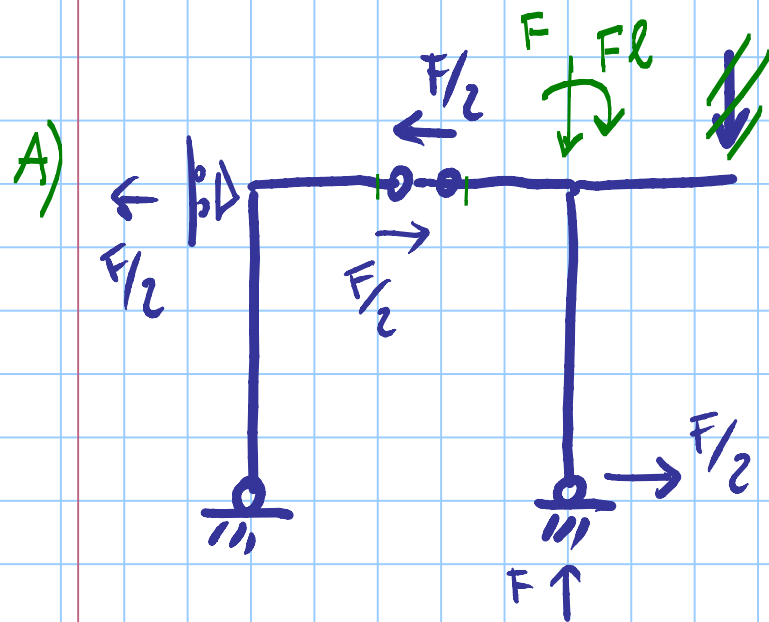
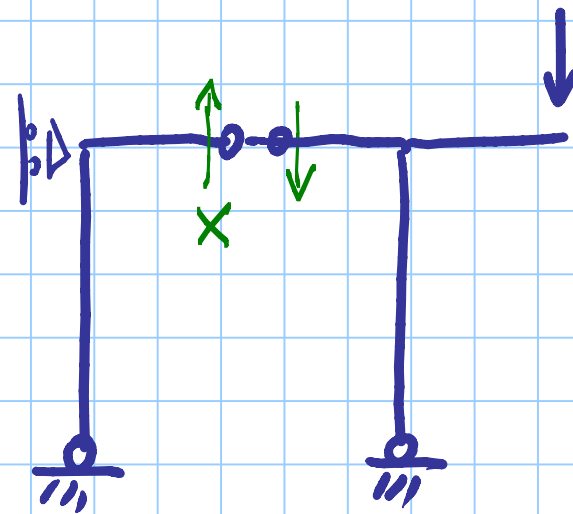
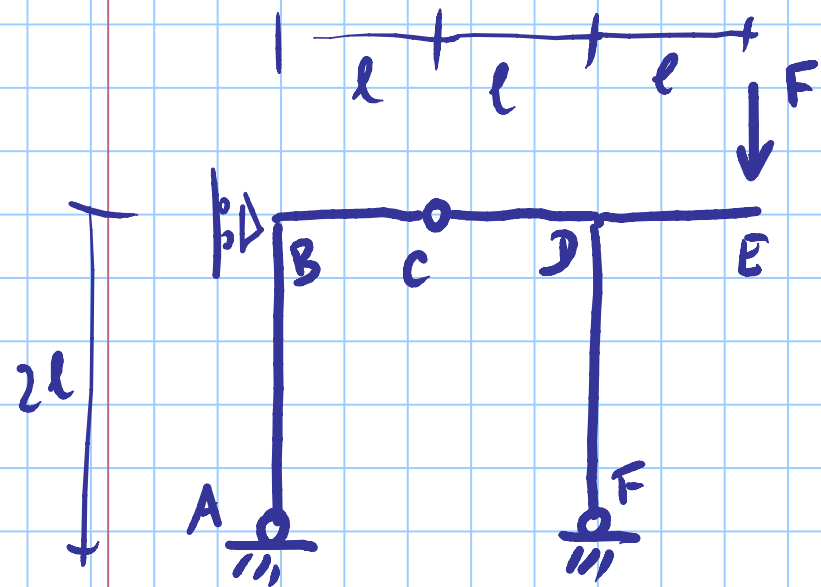


$$\varphi_B = \frac{ql^3}{4EI}$$



$$\varphi_B = \frac{Fl^2}{2EI} = \frac{\frac{ql}{2} (2l)^2}{2EI} = \frac{ql^3}{EI}$$







$$A) \quad \varphi_D = \frac{Ml}{3EI} = \frac{Fl(2l)}{3EI}$$

$$\varphi_B = \frac{x l (2l)}{3EI}$$

$$v_{c,s} = -\varphi_B l - \frac{x l^3}{3EI}$$

