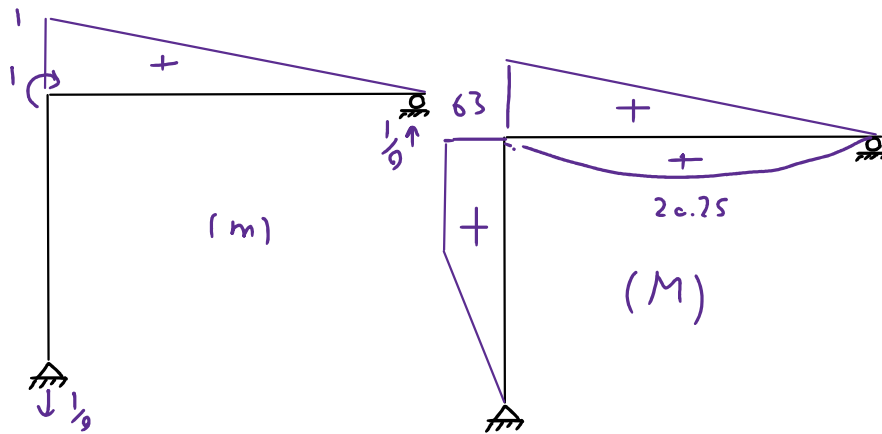
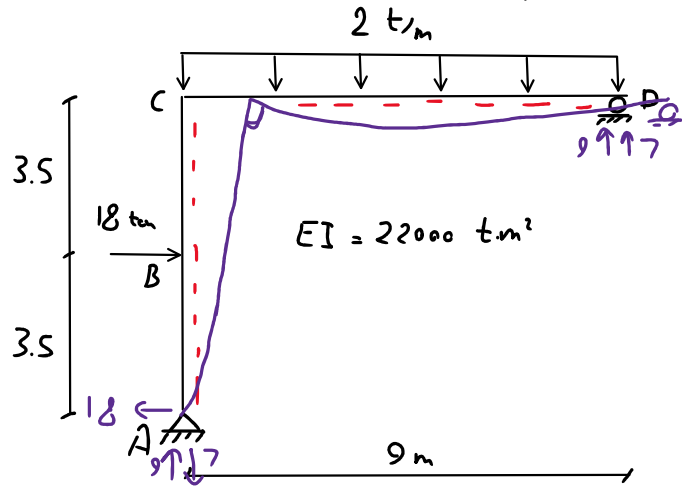


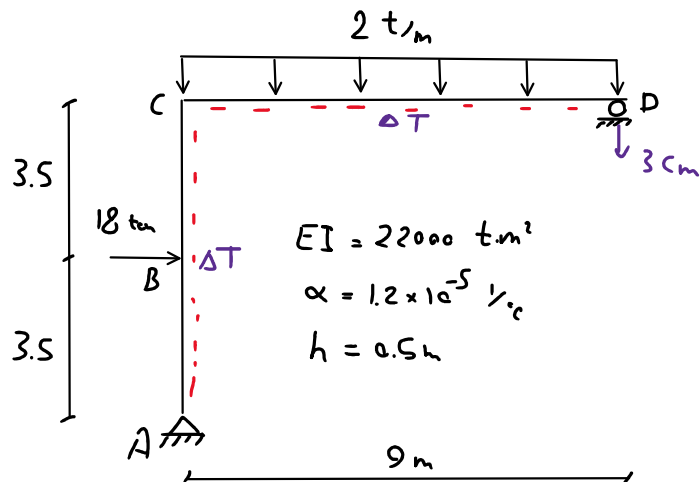
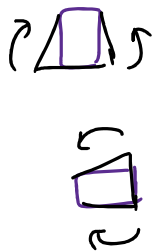
مثال: مطلوب است چرخش در C.

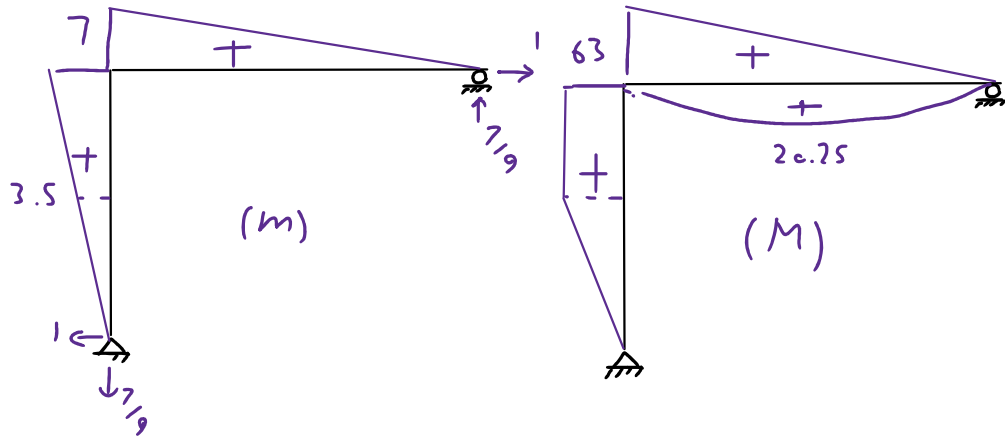
$$1 \times \theta_c = \int \frac{m/M}{EI} dx$$



$$1 \times \theta_c = \frac{1}{EI} \left[\left(\frac{9}{3}\right)(1)(63) + \left(\frac{9}{3}\right)(1)(20.25) \right] = \frac{249.75}{EI} = \frac{249.75}{22000} = 0.011 \text{ rad}$$

مثال: مطلوب است تغییر مکان افقی D ناشی از بارهای خارجی، انزایش دمای داخل سازه به مقدار 30 و نسبت تلبگاه D به مقدار 3 cm.





$$1 \times \delta_D - \left(\frac{7}{9}\right)(0.03) = \int \frac{mM}{EI} dx + \int m \frac{\alpha \Delta T}{h} dx$$

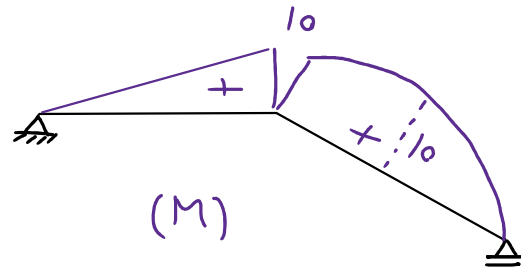
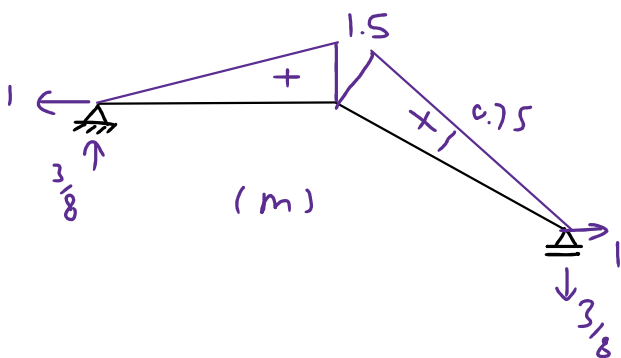
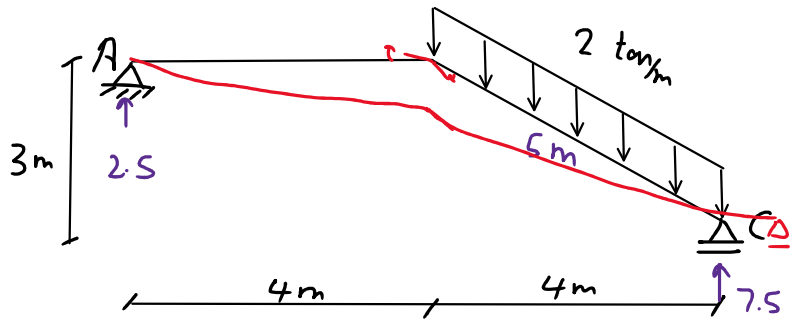
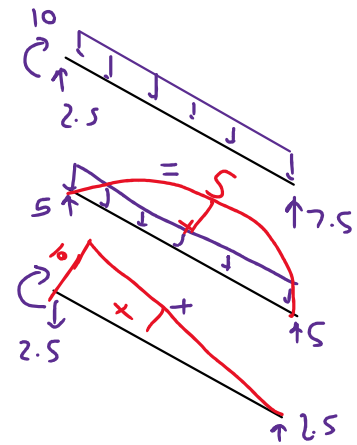
$$\int \frac{mM}{EI} dx = \frac{1}{EI} \left[\left(\frac{9}{3}\right)(7)(63) + \left(\frac{9}{3}\right)(7)(20.25) + \left(\frac{3.5}{3}\right)(3.5)(63) + 63 \left(\frac{7+3.5}{2}\right) \right]$$

$$\frac{1}{EI} \left(\frac{1748.25}{EI} + \frac{1414.87}{EI} \right) = \frac{3163}{EI} = \frac{3163}{22000} = 0.14 \text{ m} = 14 \text{ cm} \rightarrow$$

$$\int m \frac{\alpha \Delta T}{h} dx = \frac{\alpha \Delta T}{h} \left[\frac{7 \times 9}{2} + \frac{7 \times 7}{2} \right] = 56 \frac{\alpha \Delta T}{h} = 56 \times \frac{1.2 \times 10^{-5} \times 30}{0.5} = 0.04 \text{ m} = 4 \text{ cm} \rightarrow$$

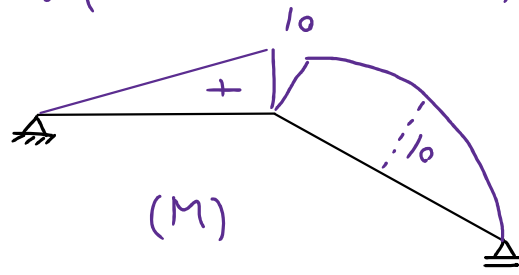
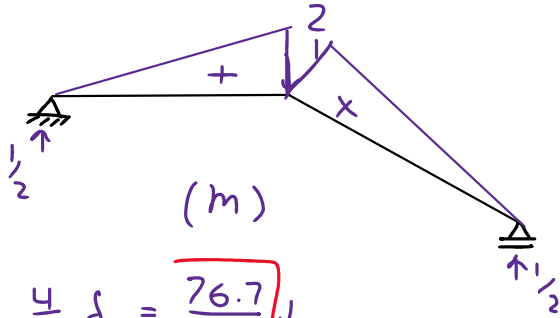
$$1 \times \delta_D - 0.0233 = 0.14 + 0.04 \rightarrow \delta_D = 20.33 \text{ cm} \rightarrow$$

مثال: مطلوب است تغییر مکان اتصالات c و تغییر مکان تاقم B و جوش B.

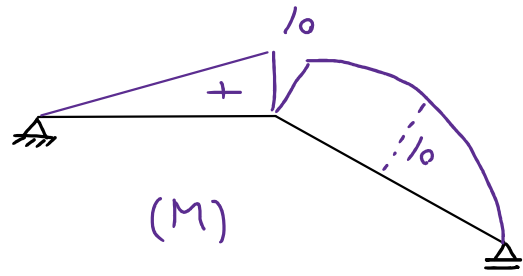
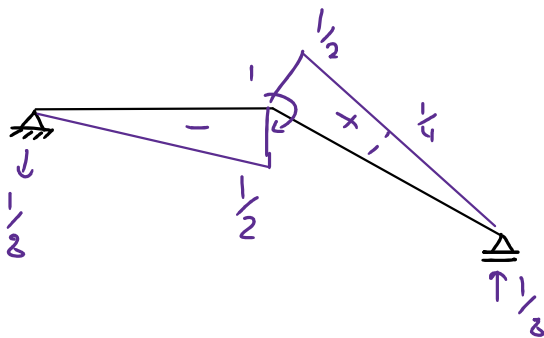


$\sim 3/8$

$$1 \times \delta_c = \int \frac{m M}{EI} dx = \frac{1}{EI} \left[\left(\frac{4}{3}\right)(1.5)(10) + \left(\frac{5}{8}\right)(1.5)(10) + 4(0.75)(10) + 0 \right] = \frac{57.5}{EI}$$



$$\delta_B = \frac{4}{3} \delta_c = \frac{76.7}{EI} \downarrow$$



$$1 \times \theta_B = \frac{1}{EI} \left[\left(\frac{4}{3}\right)\left(-\frac{1}{2}\right)(10) + \left(\frac{5}{8}\right)\left(\frac{1}{2}\right)(10) + 4\left(\frac{1}{4}\right)(10) + 0 \right] = \frac{5.83}{EI}$$