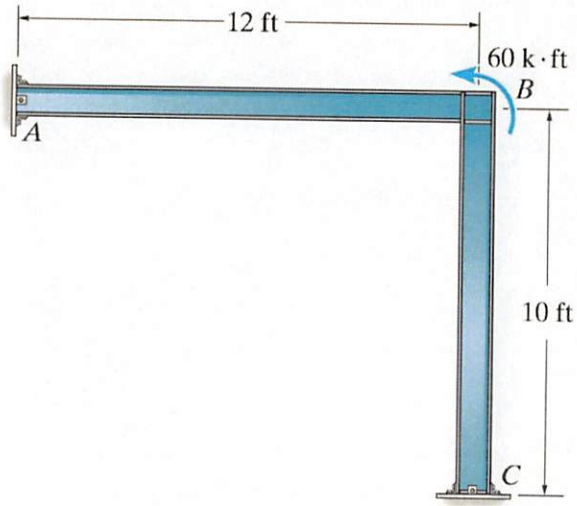
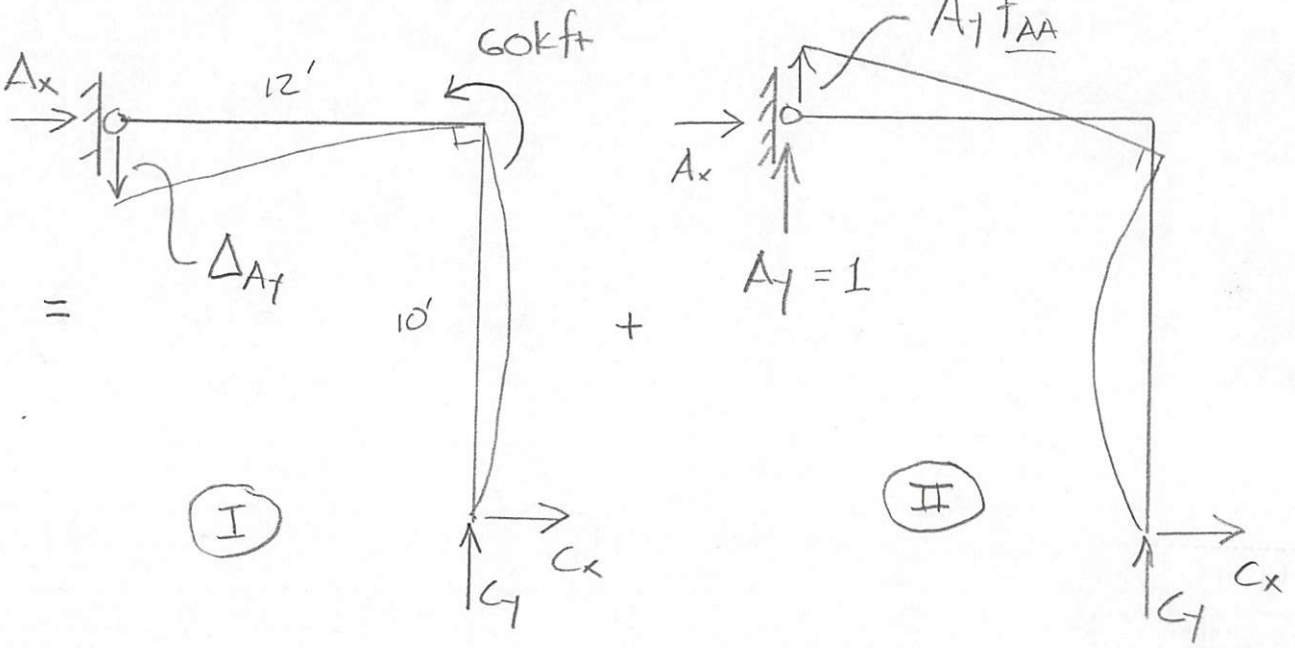
Problem 9b-1 – Compute the reactions for the following frame. Assume A_y is the redundant force.





$$\Delta_{Ay} + A_y f_{AA} = 0$$

(I) $\circlearrowleft +\sum M_c = 0 = 60\text{kft} - A_x(10') \quad A_x = 6^k$

$\rightarrow +\sum F_x = 0 = A_x + C_x \quad C_x = -6^k$

$+\uparrow \sum F_y = 0 = C_y$

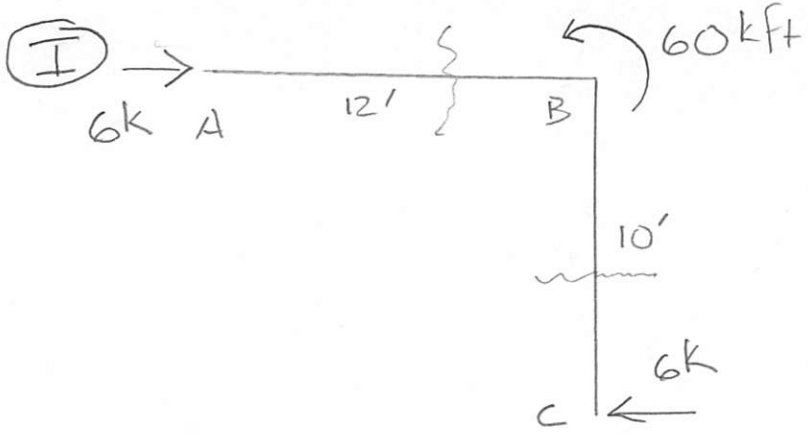
(II) $\circlearrowleft +\sum M_c = 0 = -1(12') - A_x(10') \quad A_x = -6/5$

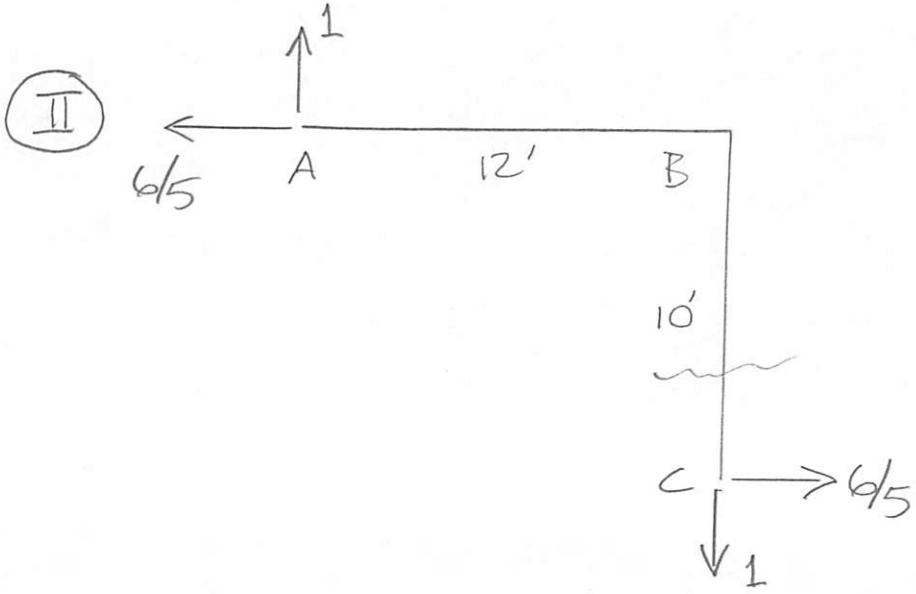
$\rightarrow +\sum F_x = 0 = A_x + C_x \quad C_x = 6/5$

$+\uparrow \sum F_y = 0 = C_y + 1 \quad C_y = -1$

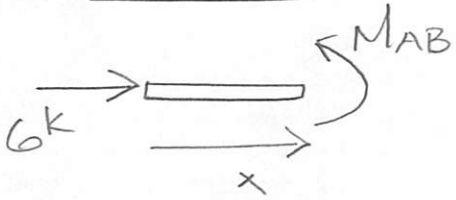
Problem 9b-1 – Compute the reactions for the following frame.

Find the displacement at *A* in the y-direction.





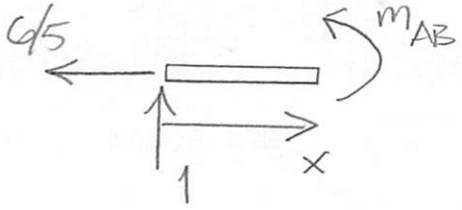
SECTION AB



$\circlearrowleft + \sum M_{CUT} = 0$

$= M_{AB} = 0$

SECTION AB

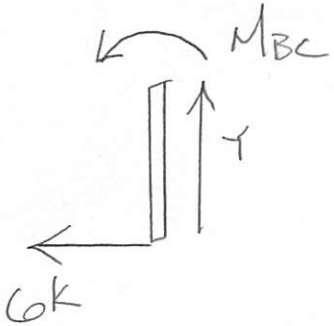


$\circlearrowleft + \sum M_{CUT} = 0$

$= m_{AB} - 1x$

$m_{AB} = x$

SECTION BC



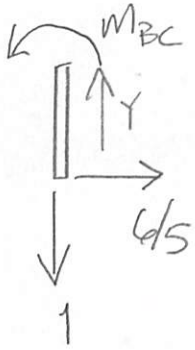
$\circlearrowleft + \sum M_{CUT} = 0$

$= M_{BC} - 6^k(Y)$

$M_{BC} = [6Y]$ kft

$0 \le Y \le 10'$

SECTION BC



$\circlearrowleft + \sum M_{CUT} = 0$

$= m_{BC} + \frac{6}{5} Y$

$m_{BC} = -\frac{6}{5} Y$

Problem 9b-1 – Compute the reactions for the following frame.

Find the displacement at *A* in the y-direction due to A_y.

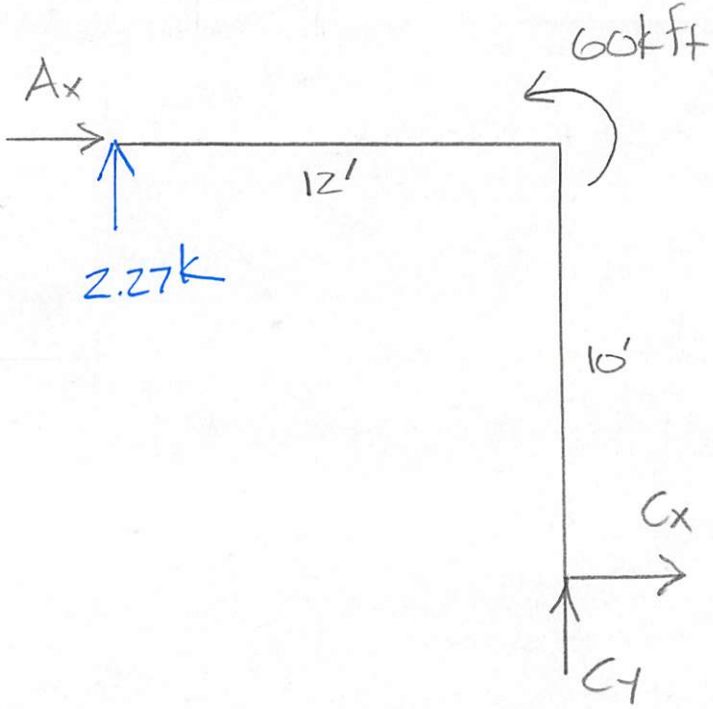
$$EI\Delta_{A_y} = \int_0^{12} M_{AB} m_{AB}\, dx + \int_0^{10} M_{BC} m_{BC}\, dy = \int_0^{10} (6y)\left(-\frac{6y}{5}\right) dy = \frac{-36y^3}{15}\Big|_0^{10} = \underline{-2{,}400\ \text{k ft}^3}$$

$$EIf_{AA} = \int_0^{12} m_{AB} m_{AB}\, dx + \int_0^{10} m_{BC} m_{BC}\, dy = \int_0^{12} x^2\, dx + \int_0^{10} \left(-\frac{6y}{5}\right)^2 dy = \frac{x^3}{3}\Big|_0^{12} + \frac{36y^3}{75}\Big|_0^{10}$$

$$= \underline{1{,}056\ \text{ft}^3}$$

$$\Delta_{A_y} + A_y f_{AA} = 0 = -2{,}400\ \text{k ft}^3 + A_y(1{,}056\ \text{ft}^3) = 0$$

$$\underline{A_y = 2.27\ \text{k}}$$



$$\text{(+)}\ \Sigma M_C = 0 = 60\ \text{k ft} - 2.27\text{k}(12') - A_x(10')$$

$$\underline{A_x = 3.27\ \text{k}}$$

$$+\uparrow \Sigma F_y = 0 = C_y + 2.27\text{k}$$

$$\underline{C_y = -2.27\ \text{k}}$$

$$\pm\rightarrow \Sigma F_x = 0 = A_x + C_x$$

$$\underline{C_x = -3.27\ \text{k}}$$