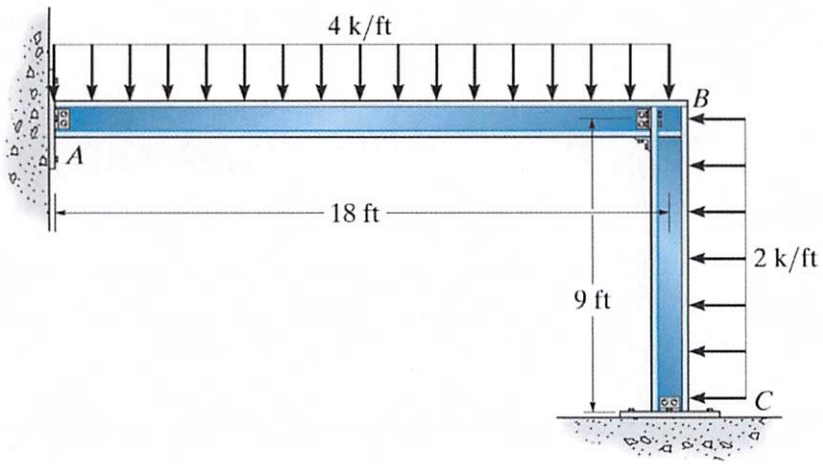
Problem 10b-1 – Determine the reactions at the supports. Assume the connections at *A*, *B*, and *C* are fixed, and *EI* is constant.



$$FEM_{AB} \quad \frac{WL^2}{12} = \pm \frac{(4k/ft)(18')^2}{12} = \pm 108\,kft$$

$$FEM_{BC} \quad \frac{WL^2}{12} = \pm \frac{(2k/ft)(9')^2}{12} = \pm 13.5\,kft$$

$$M_{AB} = \frac{2EI}{18'}\left[\theta_B\right] - 108\,kft \quad (1)$$

$$M_{BA} = \frac{2EI}{18'}\left[2\theta_B\right] + 108\,kft \quad (2)$$

$$M_{BC} = \frac{2EI}{9'}\left[2\theta_B\right] - 13.5\,kft \quad (3)$$

$$M_{CB} = \frac{2EI}{9'}\left[\theta_B\right] + 13.5\,kft \quad (4)$$

JOINT B

$$\text{(+)} \quad \sum M_B = 0 = -M_{BA} - M_{BC}$$

$$M_{BA} + M_{BC} = 0 \quad (5)$$

Problem 10b-1 – Determine the reactions at the supports. Assume the connections at *A*, *B*, and *C* are fixed, and *EI* is constant.

(5) $M_{BA} + M_{BC} = 0 = \underbrace{\frac{2EI}{18'}\left[2\theta_B\right] + 108\,k\text{-}ft}_{M_{BA}} + \underbrace{\frac{2EI}{9'}\left[2\theta_B\right] - 13.5\,k\text{-}ft}_{M_{BC}}$

$\frac{2}{3}\theta_B = -\frac{94.5\,k\text{-}ft^2}{EI}$ $\qquad$ $\theta_B = -\frac{141.75\,k\text{-}ft^2}{EI}$

$M_{AB} = \frac{2EI}{18'}\left[\theta_B\right] - 108\,k\text{-}ft = \underline{-123.75\,k\text{-}ft}$

$M_{BA} = \frac{2EI}{18'}\left[2\theta_B\right] + 108\,k\text{-}ft = \underline{76.5\,k\text{-}ft}$

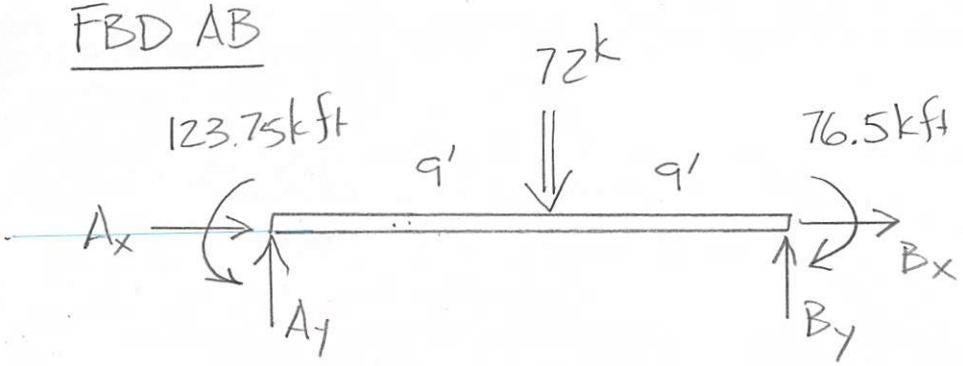
$M_{BC} = \frac{2EI}{9'}\left[2\theta_B\right] - 13.5\,k\text{-}ft = \underline{-76.5\,k\text{-}ft}$

$\Rightarrow M_{BA} + M_{BC} = 0$ ✓

$M_{CB} = \frac{2EI}{9'}\left[\theta_B\right] + 13.5\,k\text{-}ft = \underline{-18\,k\text{-}ft}$

Problem 10b-1 – Determine the reactions at the supports. Assume the connections at *A*, *B*, and *C* are fixed, and *EI* is constant.

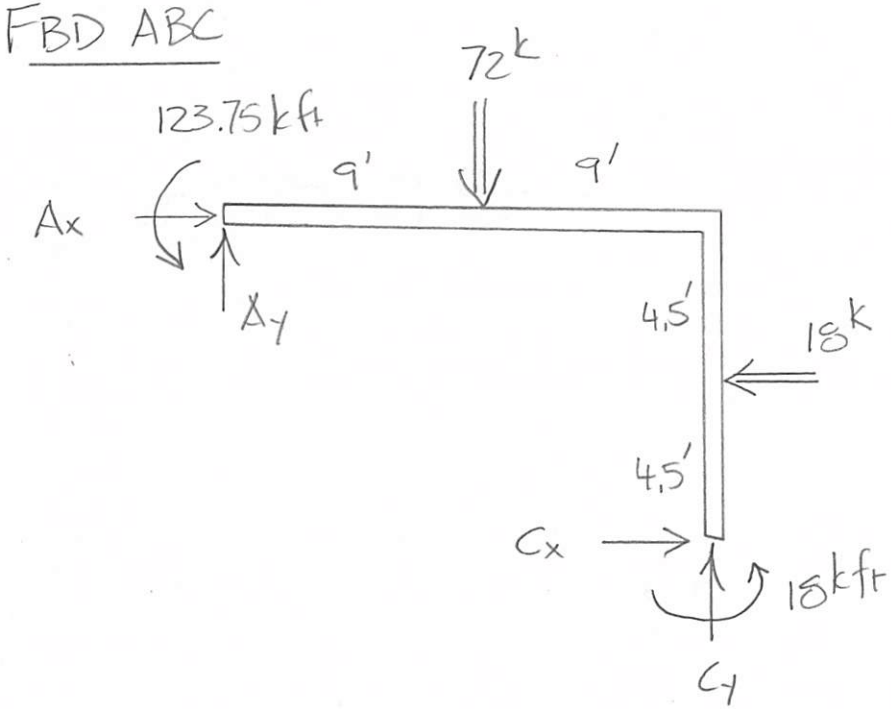
FBD AB



$$\circlearrowleft^{+}\sum M_B = 0 = -76.5\,kft + 123.75\,Kft + 72^{k}(9') - A_y(18')$$

$$\underline{A_y = 38.63^{k}}$$

FBD ABC



$$\circlearrowleft^{+}\sum M_C = 0 = 18\,kft + 123.75\,kft + 72^{k}(9') + 18^{k}(4.5') - A_y(18') - A_x(9')$$

$$\underline{A_x = 8.75^{k}}$$

$$+\uparrow\sum F_y = 0 = A_y + C_y - 72^{k}$$

$$\underline{C_y = 33.37^{k}}$$

$$\pm\rightarrow\sum F_x = 0 = A_x + C_x - 18^{k}$$

$$\underline{C_x = 9.25^{k}}$$