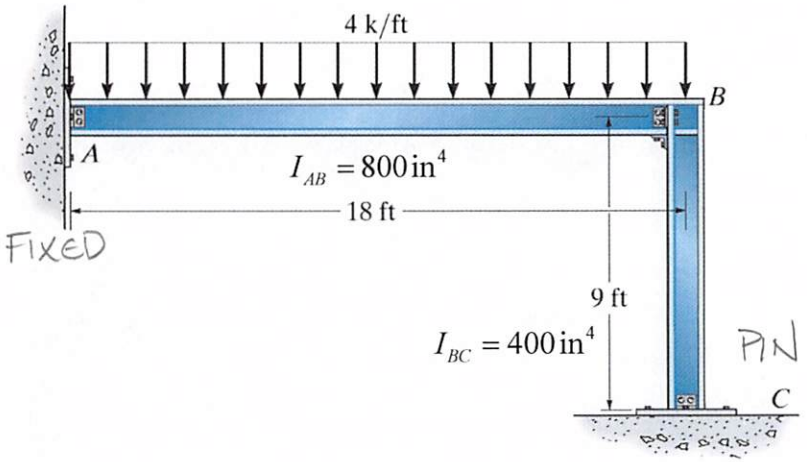
Problem 10b-3 – Determine the reactions at the supports. Assume *A* is fixed, *C* is a pin, *B* is fixed, and *EI* is constant.



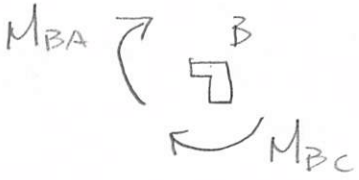
$$FEM_{AB} = FEM_{BA} = \pm \frac{WL^2}{12} = \frac{(4k/ft)(18')^2}{12} = 108\,k\text{-}ft$$

$$M_{AB} = \frac{2EI_{AB}}{18'}\left[\theta_B\right] - 108\,k\text{-}ft \quad (1)$$

$$M_{BA} = \frac{2EI_{AB}}{18'}\left[2\theta_B\right] + 108\,k\text{-}ft \quad (2)$$

$$M_{BC} = \frac{3EI_{BC}}{9'}\left[\theta_B\right] \quad (3)$$

JOINT B



$$\circlearrowleft \sum M_B = 0 = -M_{BA} - M_{BC}$$

$$M_{BA} + M_{BC} = 0 \quad (4)$$

$$I_{AB} = 2I_{BC}$$

$$(4)\ M_{BA} + M_{BC} = 0 = \underbrace{\frac{2E(2I_{BC})}{18'}\left[2\theta_B\right] + 108\,k\text{-}ft}_{M_{BA}} + \underbrace{\frac{3EI_{BC}}{9'}\left[\theta_B\right]}_{M_{BC}}$$

$$\frac{7}{9}\theta_B = -\frac{108\,k\text{-}ft^2}{EI_{BC}}$$

$$\theta_B = -\frac{972\,k\text{-}ft^2}{7EI_{BC}}$$

Problem 10b-3 – Determine the reactions at the supports. Assume *A* is fixed, *C* is a pin, *B* is fixed, and *EI* is constant.

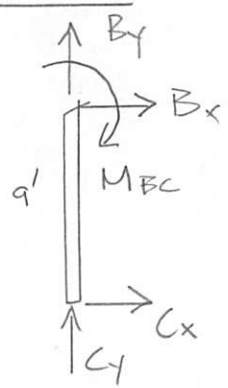
$$M_{AB} = \frac{2E(2I_{BC})}{18'}[\theta_B] - 108\,k\text{-}ft = \underline{-138.86\,k\text{-}ft}$$

$$M_{BA} = \frac{2E(2I_{BC})}{18'}[2\theta_B] + 108\,k\text{-}ft = \underline{46.28\,k\text{-}ft}$$

$$M_{BC} = \frac{3EI_{BC}}{9'}[\theta_B] = \underline{-46.28\,k\text{-}ft}$$

$M_{BA} + M_{BC} = 0$ ✓

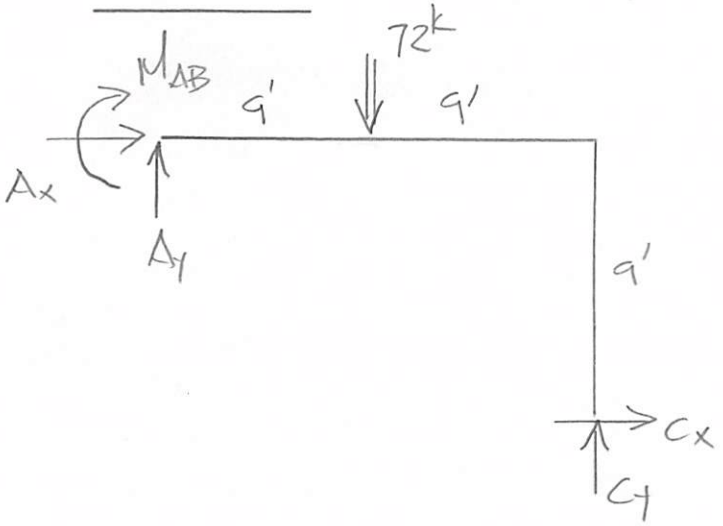
FBD BC



$$\circlearrowleft + \sum M_B = 0 = -M_{BC} + C_x(9') \qquad \underline{C_x = -5.13k}$$

Problem 10b-3 – Determine the reactions at the supports. Assume *A* is fixed, *C* is a pin, *B* is fixed, and *EI* is constant.

FBD ABC



$$\circlearrowleft + \sum M_A = 0 = -M_{AB} - 72^k(9') + C_y(18') + C_x(9')$$

$$C_y = 30.86^k$$

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

$$A_y = 41.14^k$$

$$\xrightarrow{+} \sum F_x = 0 = A_x + C_x$$

$$A_x = 5.13^k$$