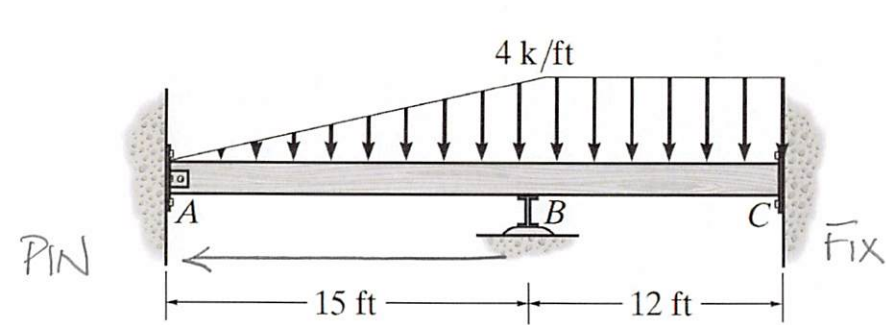


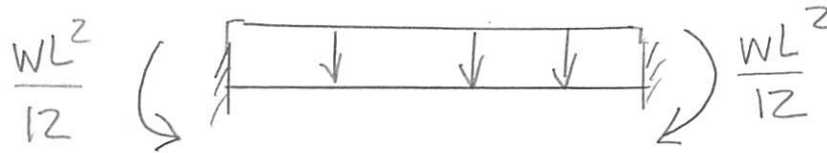
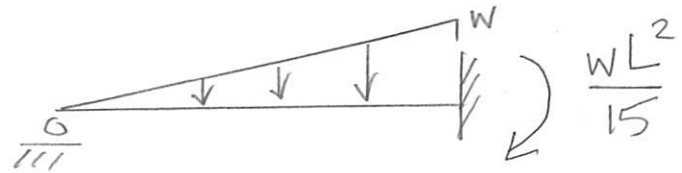
Problem 10a-2 – Determine the moment at B. Assume the support at A is pinned, B is a roller, C is fixed, and EI is constant.



$$M_{AB} = 0$$

$$FEM_{BA} = \frac{WL^2}{15} = \frac{4k/ft(15')^2}{15} = \underline{60kft}$$

FEM



$$FEM_{BC} = \frac{WL^2}{12} = \frac{4k/ft(12')^2}{12} = \underline{\pm 48kft}$$

SECTION AB – 1 EQN

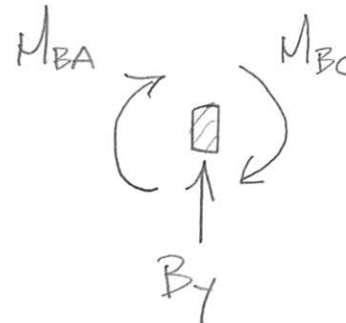
$$M_{BA} = \frac{3EI}{L_{AB}} \left[\theta_B - \frac{1}{4} \right] + 60kft \quad (1)$$

SECTION BC – 2 EQNS,

$$M_{BC} = \frac{2EI}{L_{BC}} \left[2\theta_B + \phi_C - 3 \right] - 48kft \quad (2)$$

$$M_{CB} = \frac{2EI}{L_{BC}} \left[2\phi_C + \theta_B - 3 \right] + 48kft \quad (3)$$

JOINT B



$$\sum M_B = 0$$

$$= -M_{BC} - M_{BA}$$

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

Problem 10a-2 – Determine the moment at B. Assume the support at A is pinned, B is a roller, C is fixed, and EI is constant.

$$\textcircled{4} \quad M_{BA} + M_{BC} = 0 \quad \left[\frac{3EI}{L_{AB}} (\theta_B) + 60 \text{ kft} \right] + \left[\frac{2EI}{L_{BC}} (2\theta_B) - 48 \text{ kft} \right]$$

$$\frac{3EI}{15} \theta_B + \frac{4EI}{12} \theta_B + 12 \text{ kft} \Rightarrow \frac{8EI}{15} \theta_B = -12 \text{ kft}$$

$$\theta_B = -\frac{180 \text{ kft}^2}{8EI}$$

SECTION AB

$$M_{BA} = \frac{3EI}{15 \text{ ft}} [\theta_B] + 60 \text{ kft} = \underline{\underline{55.5 \text{ kft}}}$$

SECTION BC

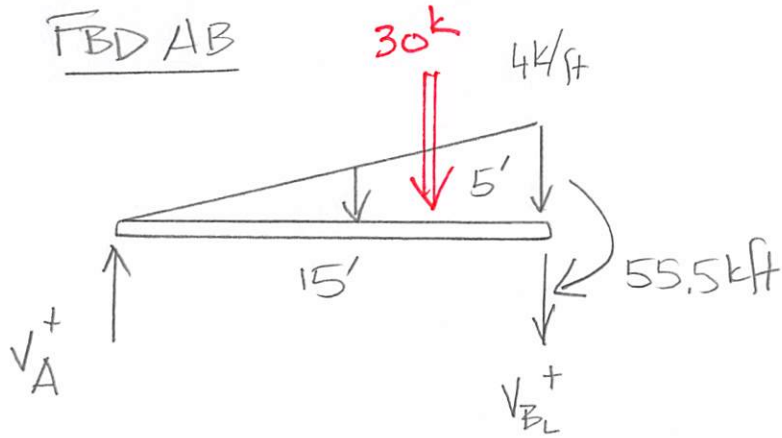
$$M_{BC} = \frac{2EI}{12 \text{ ft}} [2\theta_B] - 48 \text{ kft} = \underline{\underline{-55.5 \text{ kft}}}$$

$$\rightarrow M_{BA} + M_{BC} = 0 \quad \checkmark$$

$$M_{CB} = \frac{2EI}{12 \text{ ft}} [\theta_B] + 48 \text{ kft} = \underline{\underline{44.25 \text{ kft}}}$$

Problem 10a-3 – Determine the internal moments at the supports B and C. Assume EI is constant.

FBD AB

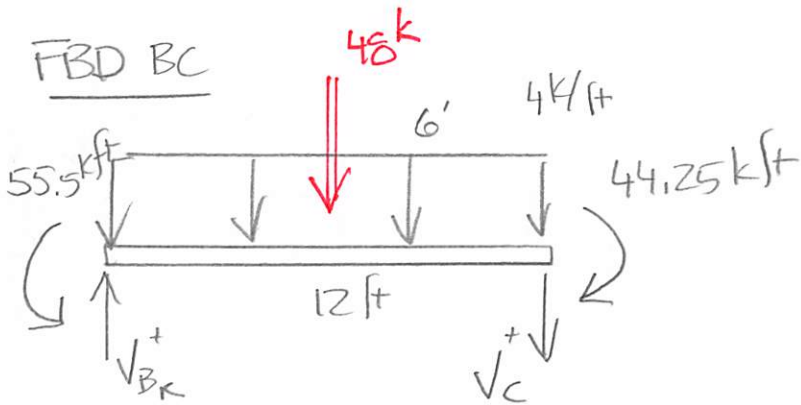


$$\sum M_B = 0 = -55.5 \text{ kft} + 30 \text{ k}(5') - V_A(15')$$

$$V_A = 6.3 \text{ k}$$

$$\sum F_y = 0 = V_A - V_B - 30 \text{ k} \quad V_B = -23.7 \text{ k}$$

FBD BC

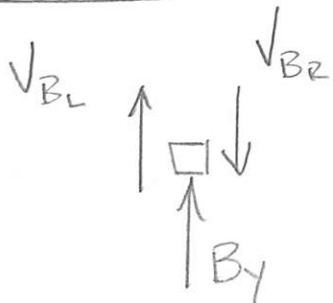


$$\sum M_C = 0 = -44.25 \text{ kft} + 55.5 \text{ kft} + 48 \text{ k}(6') - V_B(12 \text{ ft})$$

$$V_B = 24.94 \text{ k}$$

$$\sum F_y = 0 = V_B - V_C - 48 \text{ k} \quad V_C = -23.06 \text{ k}$$

JOINT B



$$\sum F_y = 0 = V_B - V_B + B_y$$

$$B_y = 48.64 \text{ k}$$