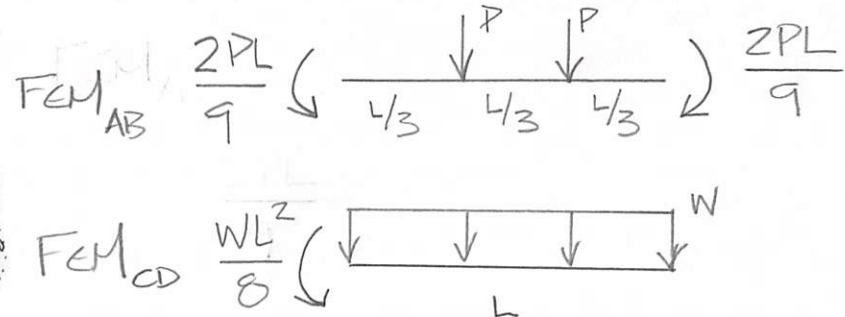
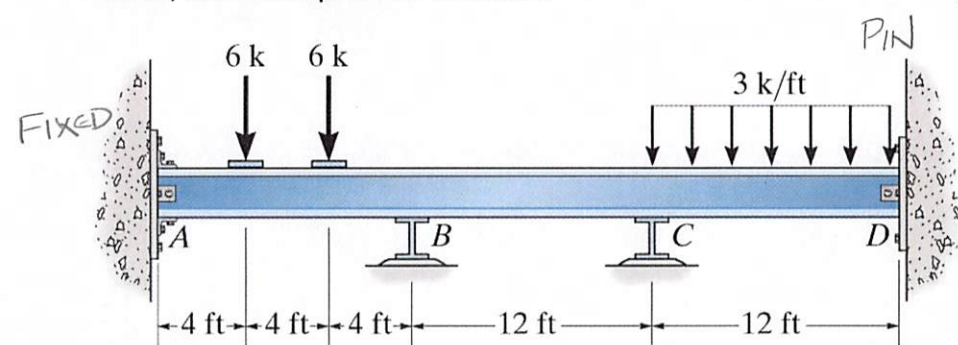


Problem 10-3 – Determine the moments at A, B, and C, then draw the moment diagram for the beam. Assume the support at A is fixed, B and C are rollers, and D is a pin. EI is constant.

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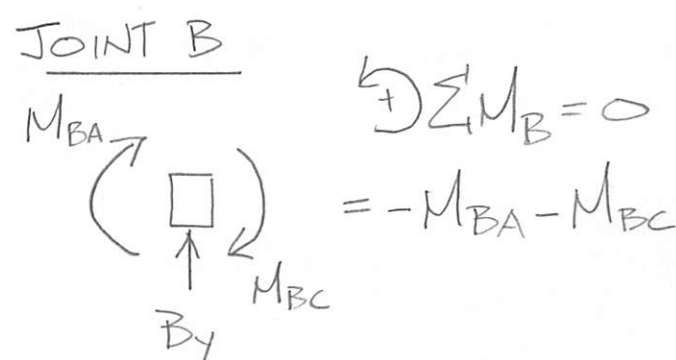
$$M_{AB} = \frac{2EI}{L_{AB}} \left[2\theta_A + \theta_B - 3\psi \right] - \frac{2(6k)(12')}{9} \quad (1)$$

$$M_{BA} = \frac{2EI}{L_{AB}} \left[2\theta_B + \theta_A - 3\psi \right] + \frac{2(6k)(12')}{9} \quad (2)$$

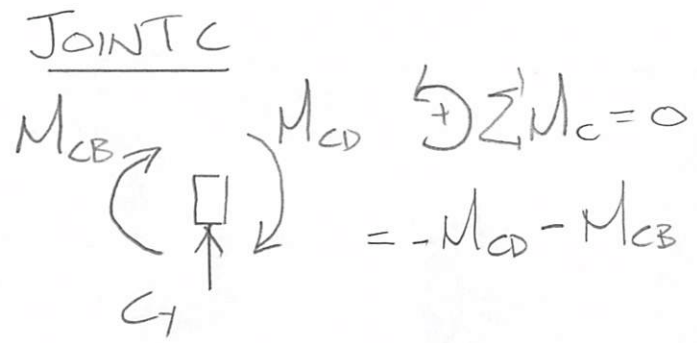
$$M_{BC} = \frac{2EI}{L_{BC}} \left[2\theta_B + \theta_C - 3\psi \right] \quad (3)$$

$$M_{CB} = \frac{2EI}{L_{BC}} \left[2\theta_C + \theta_B - 3\psi \right] \quad (4)$$

$$M_{CD} = \frac{3EI}{L_{CD}} \left[\theta_C - \psi \right] - \frac{3k/ft(12')^2}{8} \quad (5)$$



$$M_{BC} + M_{BA} = 0 \quad (6)$$



$$M_{CB} + M_{CD} = 0 \quad (7)$$

(7) EQUATIONS (7) UNKNOWNNS

Problem 10-3 – Determine the moments at A, B, and C, then draw the moment diagram for the beam. Assume the support at A is fixed, B and C are rollers, and D is a pin. EI is constant.

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$$\begin{aligned} \textcircled{6} \quad M_{BA} + M_{BC} &= 0 = \frac{2EI}{12} [2\theta_B] + 16 \text{ kft} + \frac{2EI}{12'} [2\theta_B + \theta_C] \\ &= \frac{2}{3} \theta_B + \frac{1}{6} \theta_C + \frac{16 \text{ kft}^2}{EI} \quad \textcircled{6a} \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad M_{CB} + M_{CD} &= 0 = \frac{2EI}{12} [2\theta_C + \theta_B] + \frac{3EI}{12'} [\theta_C] - 54 \text{ kft} \\ &= \frac{1}{6} \theta_B + \frac{7}{12} \theta_C - \frac{54 \text{ kft}^2}{EI} \quad \textcircled{7a} \end{aligned}$$

$$\textcircled{6a} - 4\textcircled{7a} \Rightarrow -\frac{26}{12} \theta_C + \frac{232 \text{ kft}}{EI} = 0 \Rightarrow \theta_C = \frac{1392 \text{ kft}^2}{13EI}$$

$$\theta_B = -\frac{660 \text{ kft}^2}{13EI}$$

Problem 10-3 – Determine the moments at A, B, and C, then draw the moment diagram for the beam. Assume the support at A is fixed, B and C are rollers, and D is a pin. EI is constant.

$$M_{AB} = \frac{2EI}{12'} [\theta_B] - 16 \text{ kft} = \underline{\underline{-24.46 \text{ kft}}}$$

$$M_{BA} = \frac{2EI}{12'} [2\theta_B] + 16 \text{ kft} = \underline{\underline{-0.92 \text{ kft}}}$$

$$M_{BC} = \frac{2EI}{12'} [2\theta_B + \theta_C] = \underline{\underline{0.92 \text{ kft}}}$$

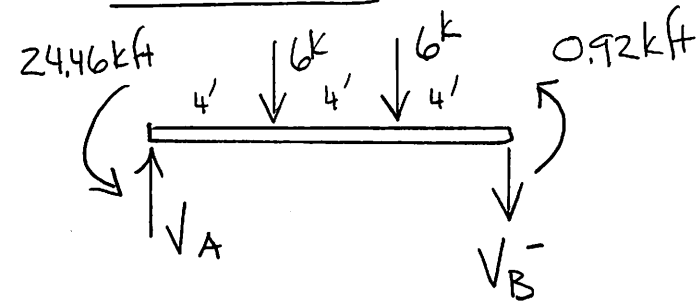
$$M_{CB} = \frac{2EI}{12'} [2\theta_C + \theta_B] = \underline{\underline{27.23 \text{ kft}}}$$

$$M_{CD} = \frac{3EI}{12'} [\theta_C] - 54 \text{ kft} = \underline{\underline{-27.23 \text{ kft}}}$$

$$\Rightarrow M_{BA} + M_{BC} = 0 \checkmark$$

$$\Rightarrow M_{CB} + M_{CD} = 0 \checkmark$$

SECTION AB



$$\sum M_B = 0 = 6^k(4') + 6^k(8') + 24.46 \text{ kft} + 0.92 \text{ kft} - V_A(12')$$

$$\underline{\underline{V_A = 8.12 \text{ k}}}$$

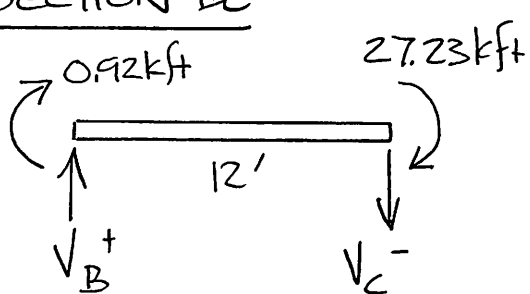
$$+\uparrow \sum F_y = 0 = V_A - 6^k - 6^k - V_B$$

$$\underline{\underline{V_B = -3.89 \text{ k}}}$$

Problem 10-3 – Determine the moments at A, B, and C, then draw the moment diagram for the beam. Assume the support at A is fixed, B and C are rollers, and D is a pin. EI is constant.

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SECTION BC



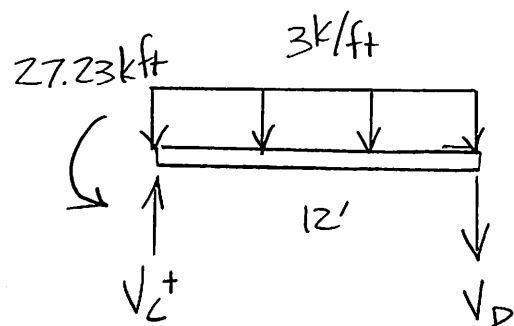
$$\sum M_C = 0 = -27.23 \text{ kft} - 0.92 \text{ kft} - V_B^+ (12')$$

$$V_B^+ = -2.35 \text{ k}$$

$$\sum F_y = 0 = V_B^+ - V_C^-$$

$$V_C^- = -2.35 \text{ k}$$

SECTION CD



$$\sum M_D = 0 = 36 \text{ k}(6') + 27.23 \text{ kft} - V_C^+ (12')$$

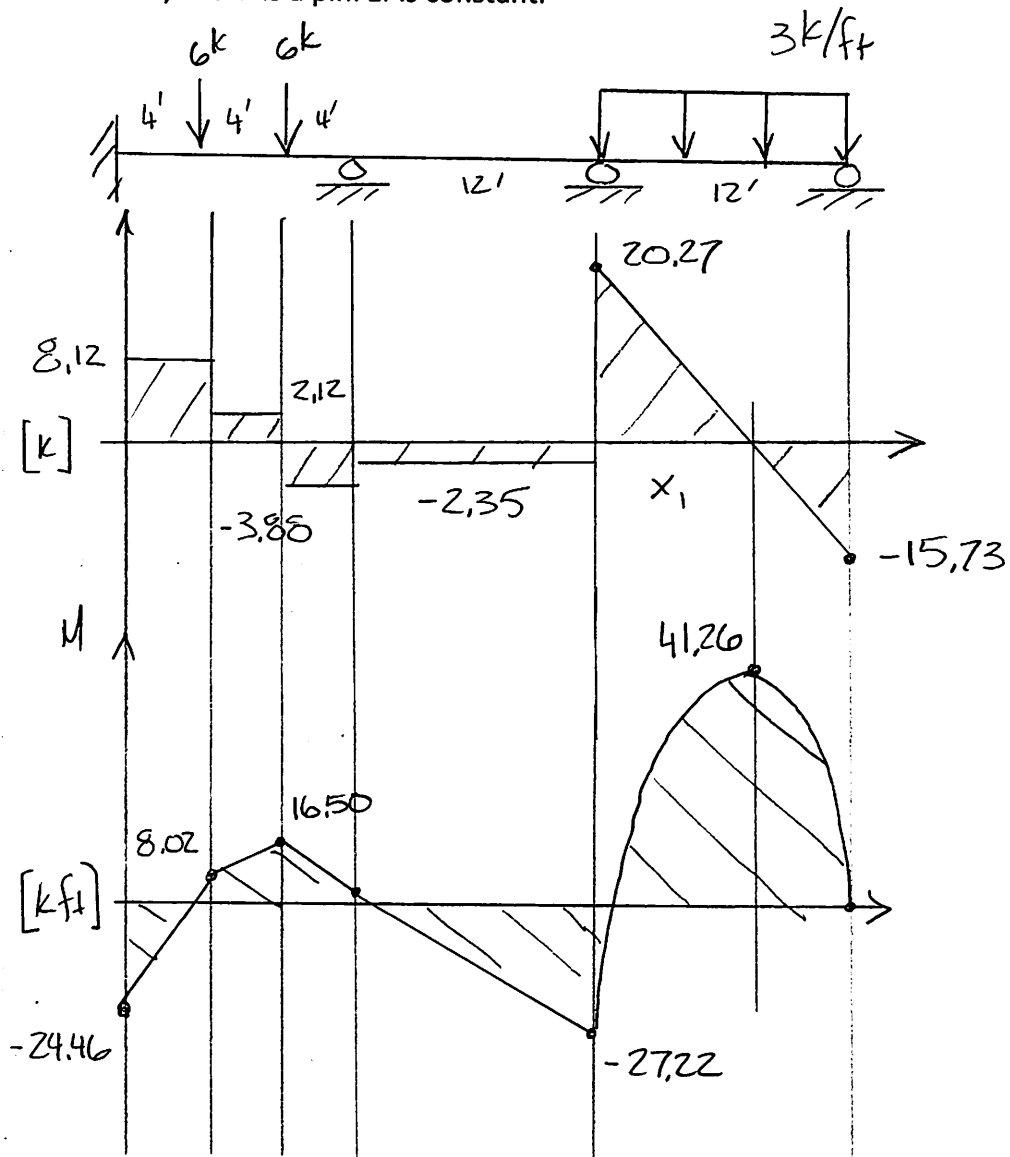
$$V_C^+ = 20.27 \text{ k}$$

$$\sum F_y = 0 = V_C^+ - V_D - 36 \text{ k}$$

$$V_D = -15.73 \text{ k}$$

Problem 10-3 – Determine the moments at A, B, and C, then draw the moment diagram for the beam. Assume the support at A is fixed, B and C are rollers, and D is a pin. EI is constant.

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$$x_1 = \frac{20.27 \text{ k}}{3 \text{ k/ft}} = 6.76 \text{ ft}$$