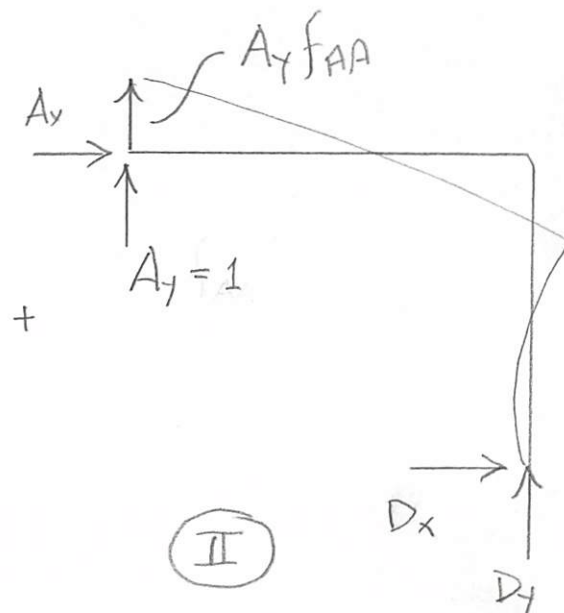
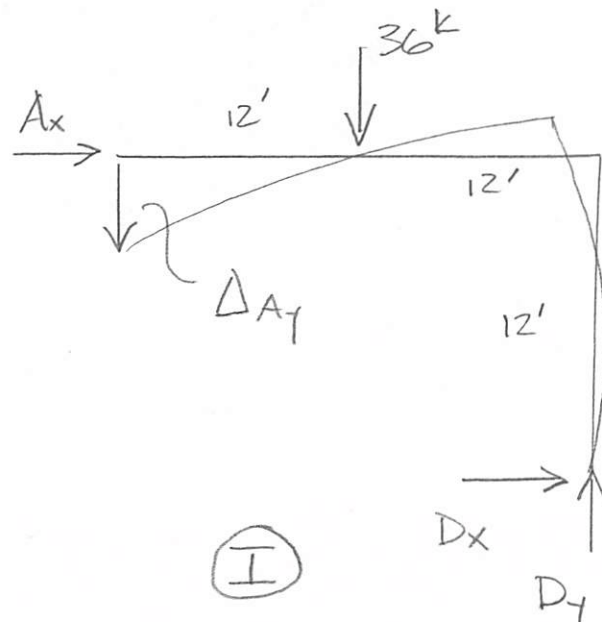
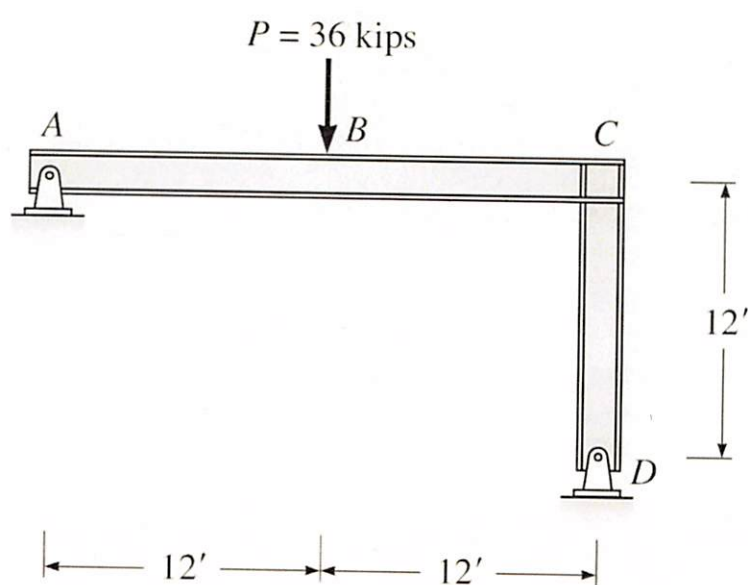


Problem 9b-2 – Compute the reactions for the following frame. Assume A_y is the redundant force.



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

(I) $\begin{aligned} \sum M_D &= 0 = 36^k(12') - A_x(12') \\ \sum F_x &= 0 = A_x + D_x \\ \sum F_y &= 0 = D_y - 36^k \end{aligned}$

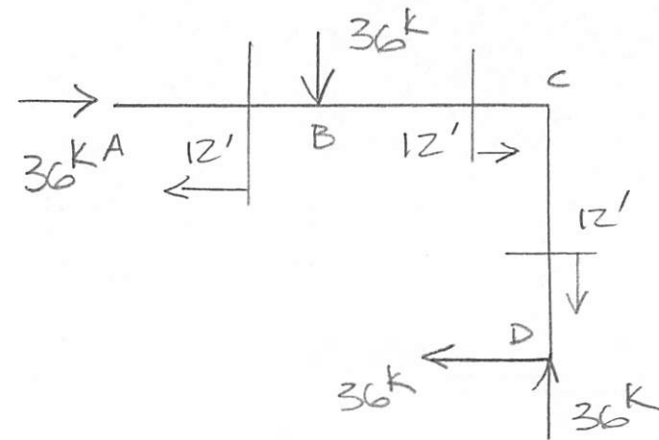
$$\begin{aligned} A_x &= 36^k \\ D_x &= -36^k \\ D_y &= 36^k \end{aligned}$$

(II) $\begin{aligned} \sum M_D &= 0 = -1(24') - A_x(12') \\ \sum F_x &= 0 = A_x + D_x \\ \sum F_y &= 0 = D_y + 1 \end{aligned}$

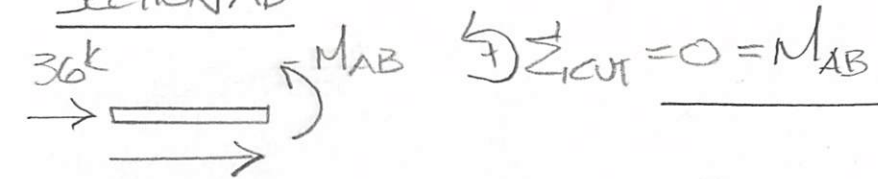
$$\begin{aligned} A_x &= -2 \\ D_x &= 2 \\ D_y &= -1 \end{aligned}$$

Problem 9b-2 – Compute the reactions for the following beam.

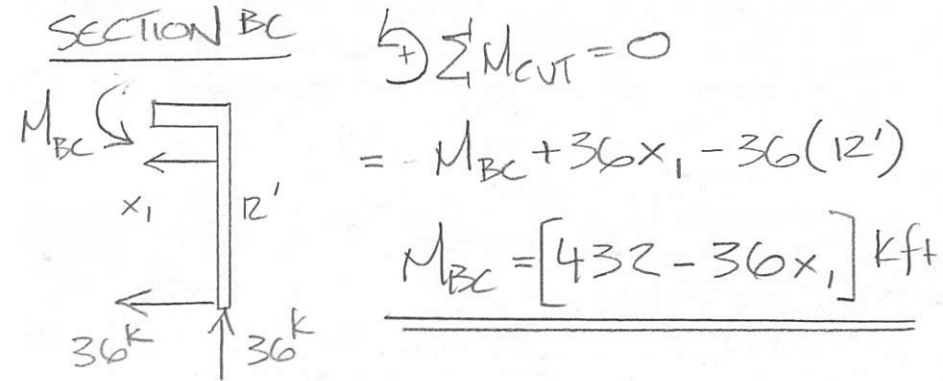
2/4



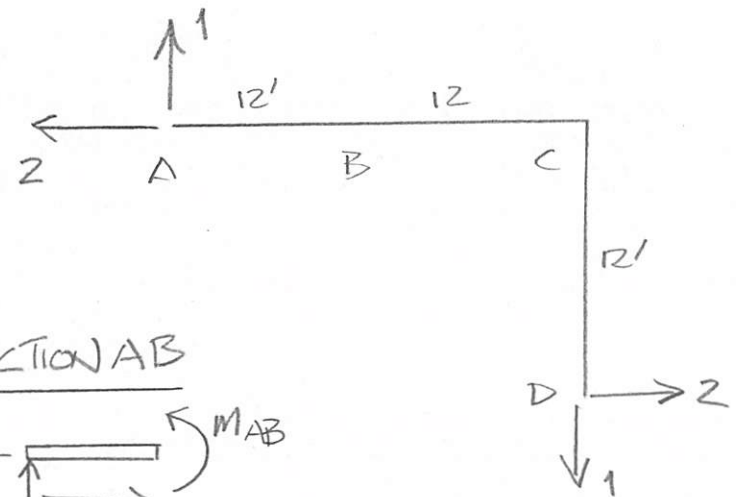
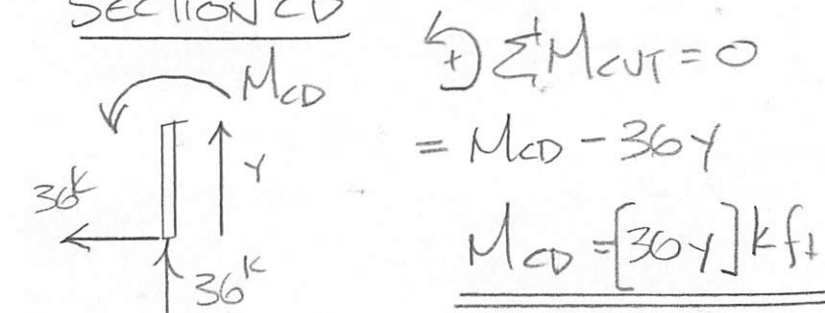
SECTION AB



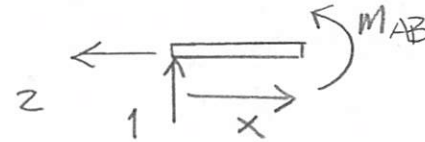
SECTION BC



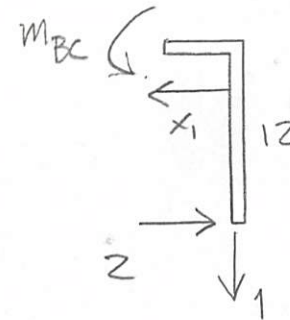
SECTION CD



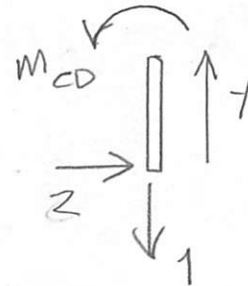
SECTION AB



SECTION BC



SECTION CD



Problem 9b-2 - Compute the reactions for the following beam.

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$$EI\Delta_{A_1} = \int_0^{12} M_{BC} m_{BC} dx_1 + \int_0^{12} M_{CD} m_{CD} dy$$

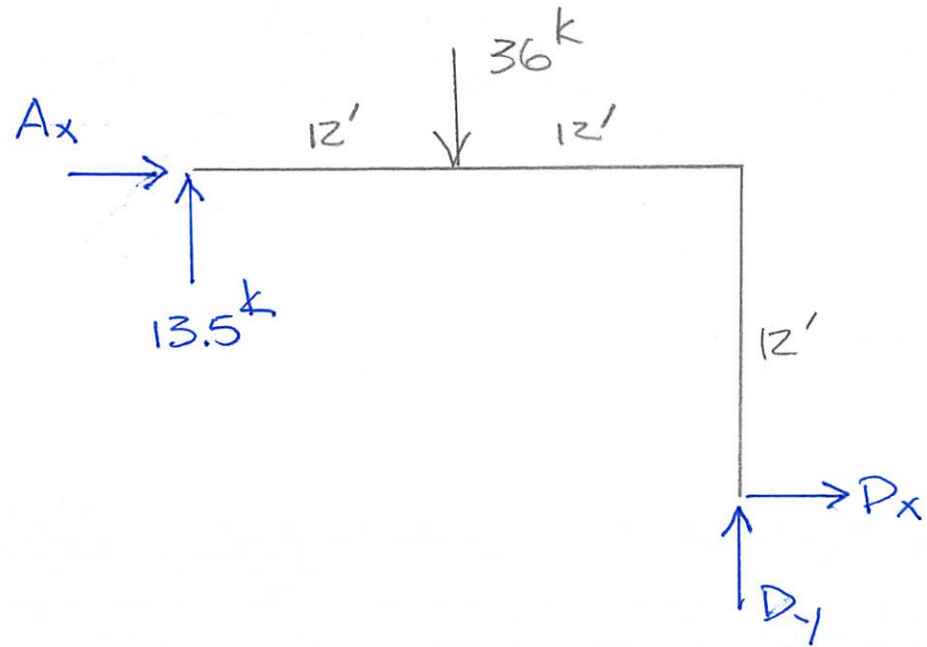
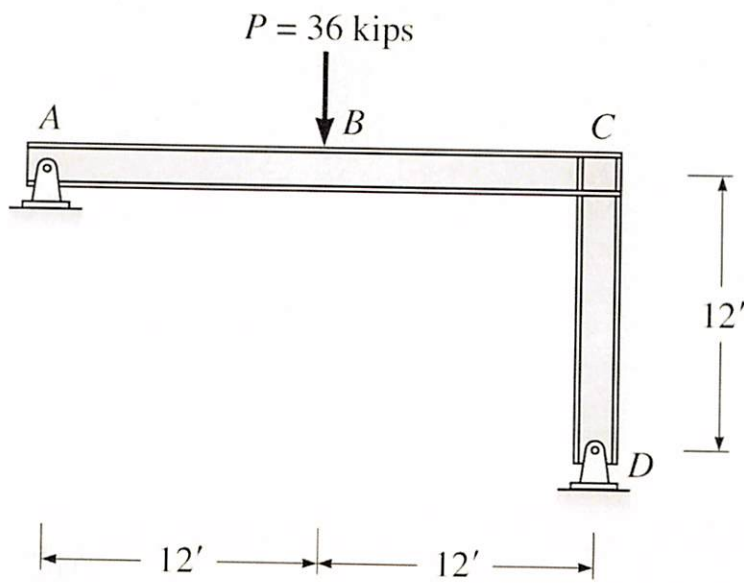
$$EI f_{AA} = \int_0^{12} \underline{M_{AB}} m_{AB} dx + \int_0^{12} m_{BC} m_{BC} dx_1 + \int_0^{12} m_{CD} m_{CD} dy$$

$$\begin{aligned} EI\Delta_{A_1} &= \int_0^{12} (432 - 36x_1)(x_1 - 24) dx_1 + \int_0^{12} (36y)(-24) dy \\ &= \int_0^{12} (-36x_1^2 + 1,296x_1 - 10,368) dx_1 + \int_0^{12} (-72y^2) dy \\ &= \left[-12x_1^3 + 648x_1^2 - 10,368x_1 \right]_0^{12} - 24y^3 \Big|_0^{12} = \underline{-93,312 \text{ kft}^3} \end{aligned}$$

$$\begin{aligned} EI f_{AA} &= \int_0^{12} (x)^2 dx + \int_0^{12} (x_1 - 24)^2 dx_1 + \int_0^{12} (-24)^2 dy \\ &= \frac{x^3}{3} \Big|_0^{12} + \left[\frac{x_1^3}{3} - 24x_1^2 + 576x_1 \right]_0^{12} + \frac{4y^3}{3} \Big|_0^{12} = 6,912 \text{ ft}^3 \end{aligned}$$

$$\Delta_{A_1} + A_1 f_{AA} = 0 = -93,312 \text{ kft}^3 + A_1 (6,912 \text{ ft}^3) \quad \underline{\underline{A_1 = 13.5 \text{ k}}}$$

Problem 9b-2 – Compute the reactions for the following beam.



$$\sum M_D = 0 = 36^k(12') - 13.5^k(24') - A_x(12')$$

$$\underline{\underline{A_x = 9^k}}$$

$$\sum F_x = 0 = A_x + D_x \quad \underline{\underline{D_x = -9^k}}$$

$$\sum F_y = 0 = D_y + 13.5^k - 36^k$$

$$\underline{\underline{D_y = 22.5^k}}$$