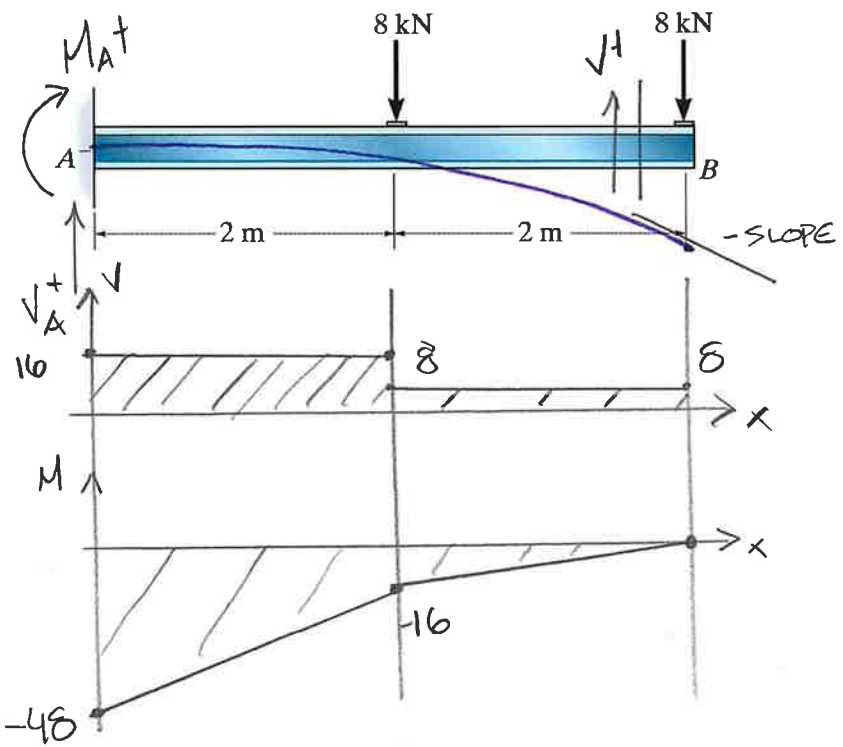
Example 7b-2: Determine the slope at *B* and the displacement at mid-span.
Assume that E = 200 GPa and I = 550(10^6) mm^4.

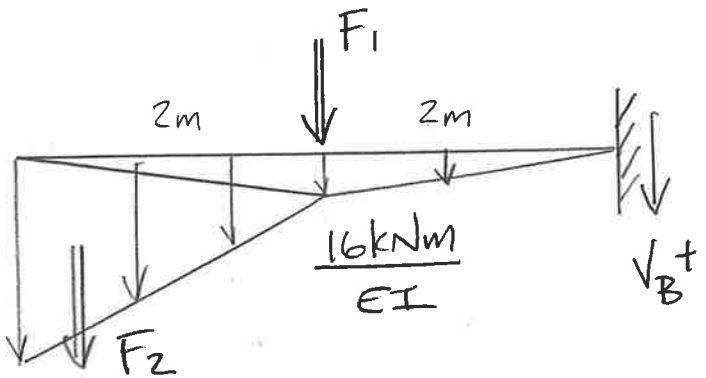


$$\curvearrowleft + \sum M_A = 0 = -M_A - 8kN(2m + 4m)$$

$$M_A = -48\,kNm$$

$$+\uparrow \sum F_y = 0 = V_A - 8kN - 8kN \qquad V_A = 16kN$$

CONJUGATE BEAM



$$+\uparrow \sum F_y = 0 = -V_B - F_1 - F_2$$

$$V_B = -\frac{80\,kN\,m^2}{EI} \Rightarrow \theta_B$$

$$\theta_B = -\frac{80\,kN\,m^2}{200(10^6)\,kN/m^2 \; 550(10^6)\,mm^4 \left(\frac{10^3\,mm}{m}\right)^4}$$

$$= -0.0007 \text{ RADIANS}$$

$$F_1 = \frac{1}{2}(4m)\frac{16kNm}{EI} = \frac{32kNm^2}{EI}$$

$$F_2 = \frac{1}{2}\left(\frac{48kNm}{EI}\right)2m = \frac{48kNm^2}{EI}$$

Example 7b-2: Determine the slope at *B* and the displacement at mid-span.
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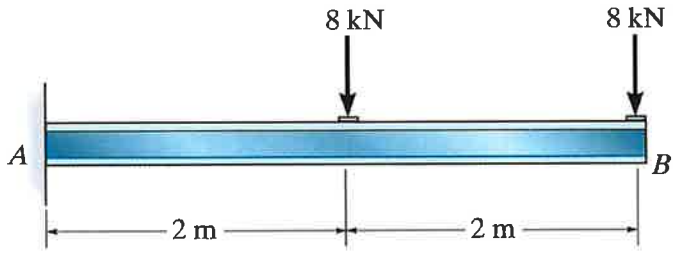

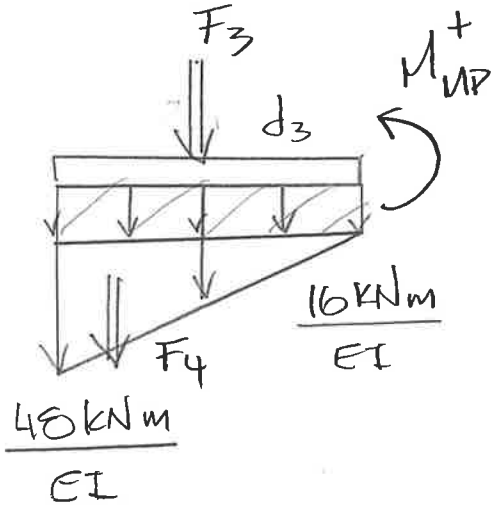

$$\curvearrowleft + \sum M_{CUT} = 0 = M_{MP} + F_3 d_3 + F_4 d_4$$

$$M_{MP} = -\frac{224\ kN m^3}{3EI} \Rightarrow Y_{MP}$$

$$Y_{MP} = -\frac{224\ \cancel{kN m^3}}{3} \cdot \frac{m^2}{200(10^6)\cancel{kN}} \cdot \frac{1}{550(10^6)\cancel{mm^4}} \cdot \left(\frac{10^3\ \cancel{mm}}{\cancel{m}}\right)^4$$

$$= -0.678\ mm$$

$$F_3 = 2m\left(\frac{16kNm}{EI}\right) = \frac{32kNm^2}{EI}$$

$$F_4 = \frac{1}{2}(2m)\frac{32kNm}{EI} = \frac{32kNm^2}{EI}$$

$$d_3 = 1m \qquad d_4 = \frac{2}{3}(2m) = \frac{4}{3}m$$