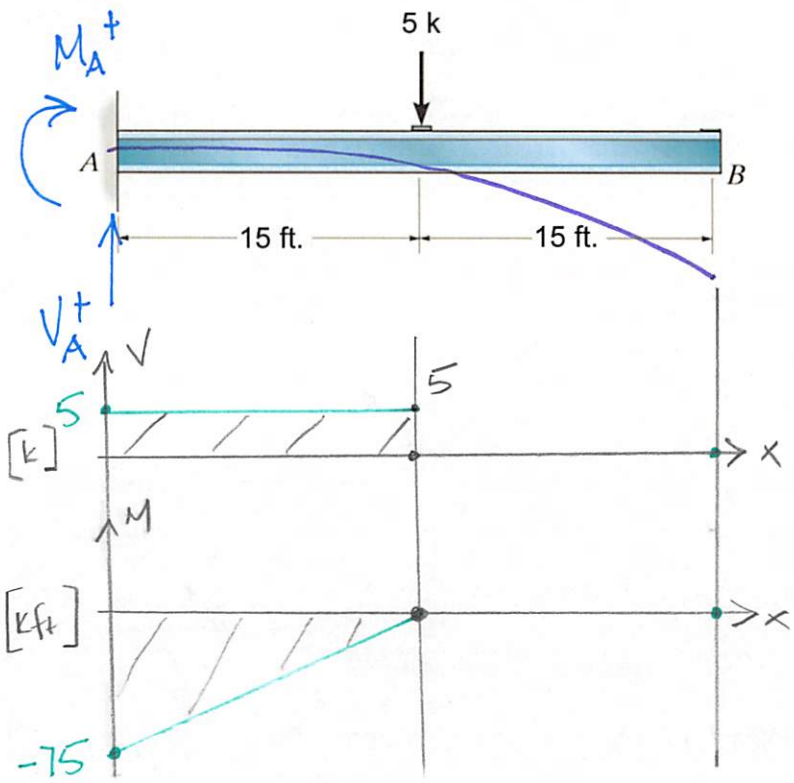
Example 7b-1: Determine the slope and the displacement at point B for the beam. Assume that E = 30,000 ksi and I = 800 in^4.



$\circlearrowleft^+ \Sigma M_A = 0 = -M_A - 5^k(15') \qquad M_A = -75 k\,ft$

$+\uparrow \Sigma F_y = 0 = V_A - 5^k \qquad V_A = 5^k$

$$F = \frac{1}{2}(15')\frac{75 k\,ft}{EI} = \frac{562.5 k\,ft^2}{EI}$$

$$d = 15' + \frac{2}{3}(15') = 25'$$

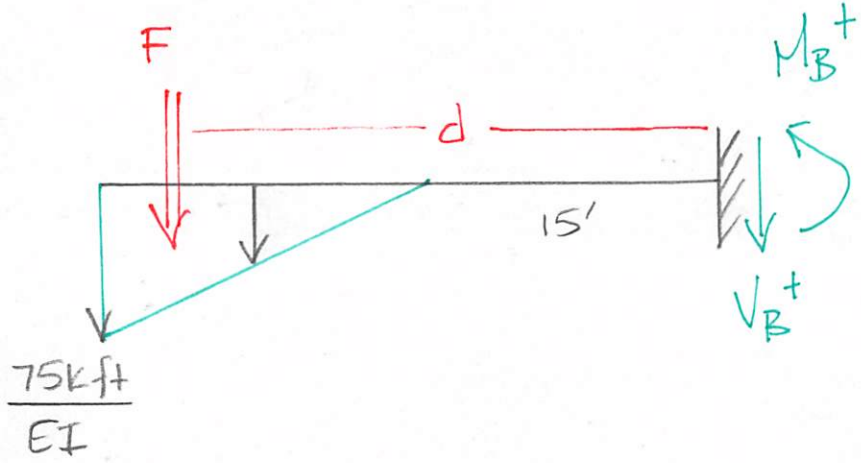
$+\uparrow \Sigma F_y = 0 = -F - V_B \qquad V_B = -F \Rightarrow \theta_B$

$$\theta_B = -\frac{562.5 k\,ft^2}{EI}$$

$$= -\frac{562.5 k\,ft^2}{30{,}000 k} \left|\frac{in^2}{800\,in^4}\right| \frac{(12\,in)^2}{ft^2}$$

$$= \underline{0.0034 \text{ RADIANS}}$$

CONJUGATE BEAM



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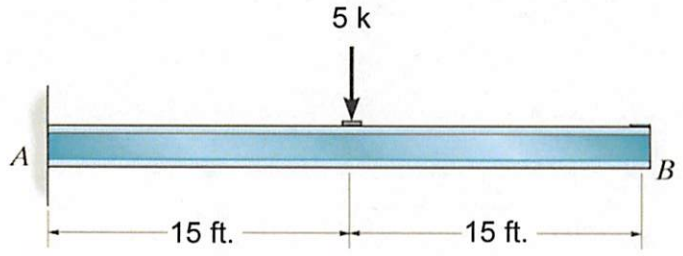

$$\text{(+)}\sum M_C = 0 = M_C + Fd \qquad M_C = -Fd$$

$$M_C \Rightarrow Y_C = -\frac{562.5\ \text{k-ft}^2}{EI}(25') = -\frac{14{,}062.5\ \text{k-ft}^3}{EI}$$

$$Y_C = -\frac{14{,}062.5\ \text{k-ft}^3}{30{,}000\ \text{k}} \cdot \frac{\text{in}^2}{800\ \text{in}^4} \cdot \frac{(12\ \text{in})^3}{\text{ft}^3}$$

$$Y_C = 1.013\ \text{in}$$