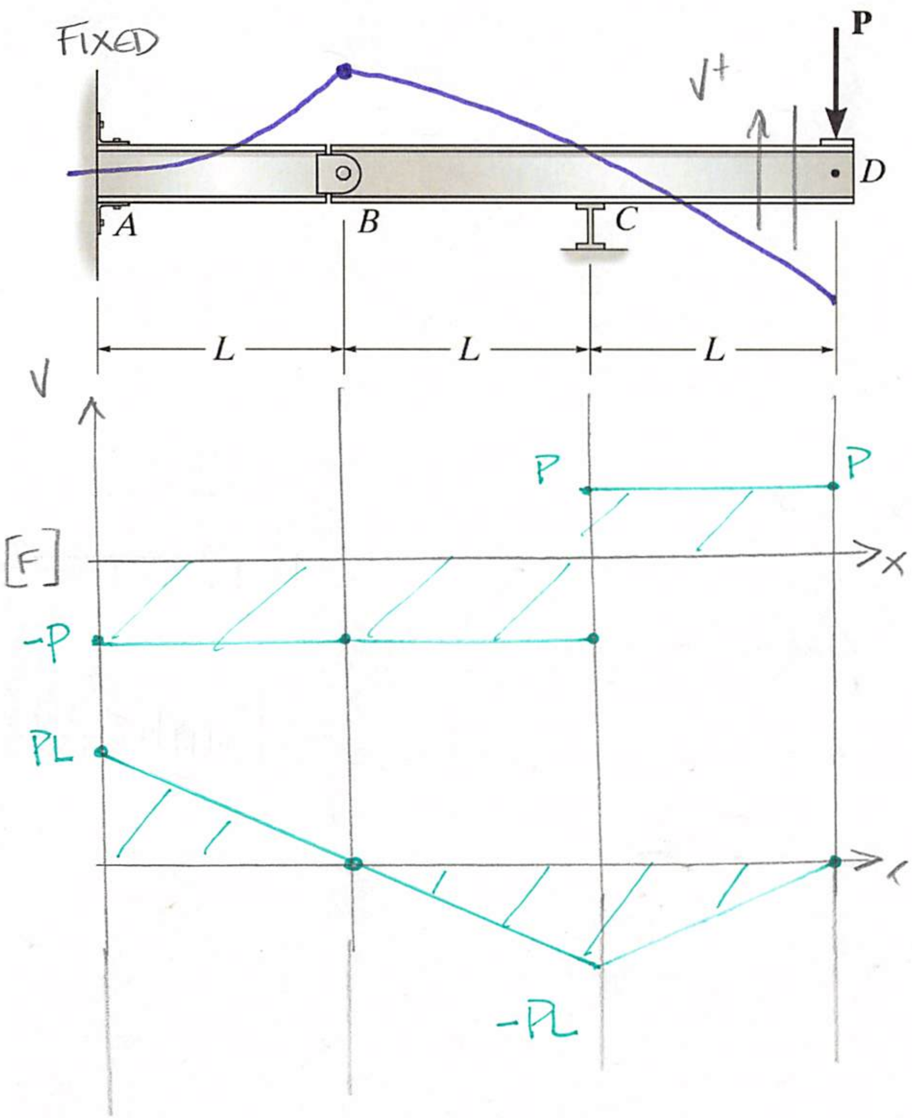
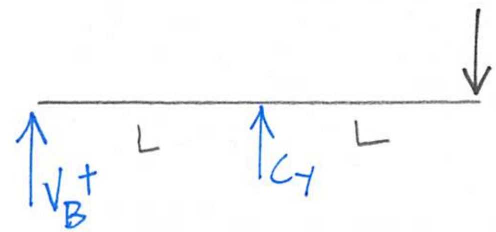
Example 7b-6: Use the conjugate beam method to determine the slope and displacement at point *D*. Assume that *EI* is constant.



FBD BCD



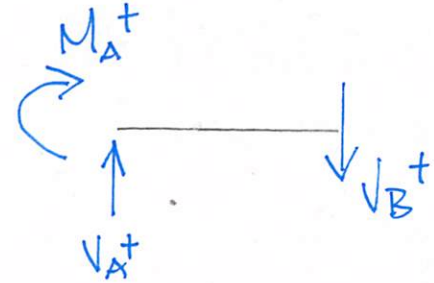
$$\circlearrowleft^{+} \sum M_B = 0$$

$$= C_y(L) - P(2L)$$

$$\underline{C_y = 2P}$$

$$+\uparrow \sum F_y = 0 = V_B + C_y - P \qquad \underline{V_B = -P}$$

FBD AB



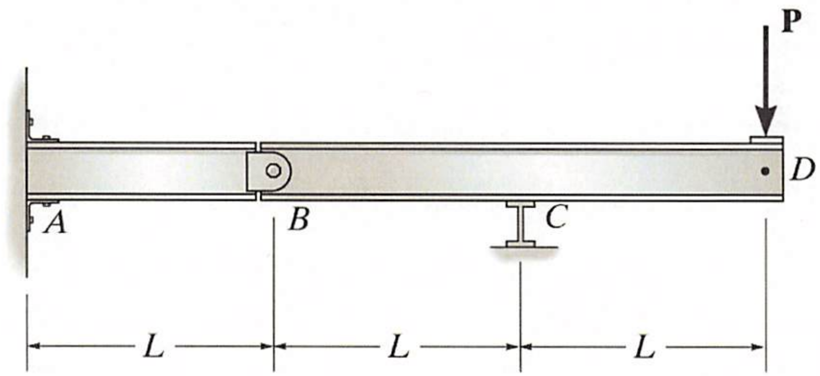
$$\circlearrowleft^{+} \sum M_A = 0 = -M_A - V_B(L)$$

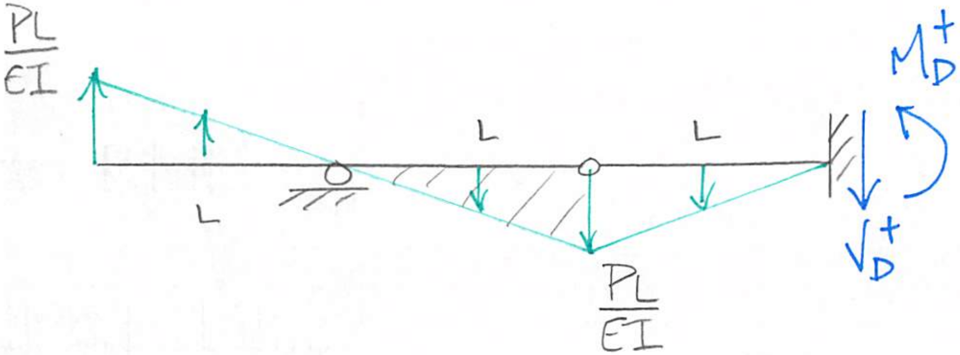
$$\underline{M_A = PL}$$

$$\uparrow \sum F_y = 0 = V_A - V_B$$

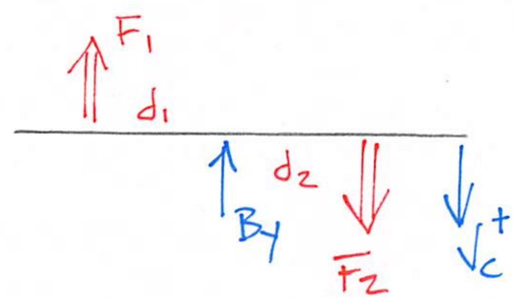
$$\underline{V_A = -P}$$

Example 7b-6: Use the conjugate beam method to determine the slope and displacement at point *D*. Assume that *EI* is constant.





FBD ABC



$$F_1 = \frac{1}{2}(L)\frac{PL}{EI} = \frac{PL^2}{2EI}$$

$$F_2 = F_1$$

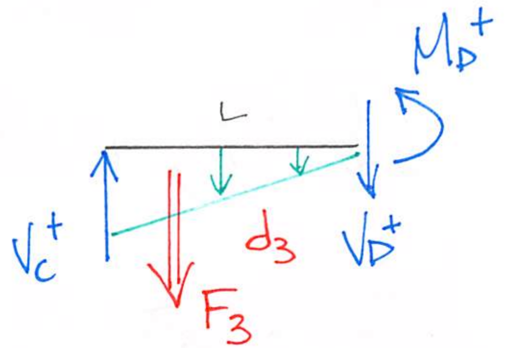
$$d_1 = \frac{2}{3}L \qquad d_2 = d_1$$

$$\circlearrowleft + \sum M_B = 0 = -F_1 d_1 - F_2 d_2 - V_C L$$

$$V_C = \left[\frac{PL^2}{2EI}\left(\frac{2}{3}L\right) + \frac{PL^2}{2EI}\left(\frac{2}{3}L\right)\right] / L$$

$$\underline{V_C = -\frac{2PL^2}{3EI}}$$

FBD CD



$$\circlearrowleft + \sum M_D = 0 = M_D + F_3 d_3 - V_C(L)$$

$$M_D = -F_3 d_3 + V_C(L) = \frac{-PL^2}{2EI}\left(\frac{2L}{3}\right) - \frac{2PL^2}{3EI}(L)$$

$$\underline{\underline{= -\frac{PL^3}{EI}}} \Rightarrow Y_C$$

$$+\uparrow \sum F_y = 0 = V_C - F_3 - V_D \qquad \underline{\underline{V_D = -\frac{7PL^2}{6EI}}}$$