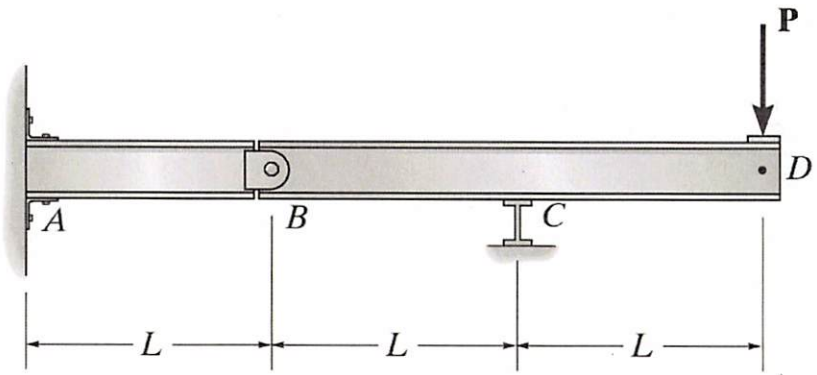
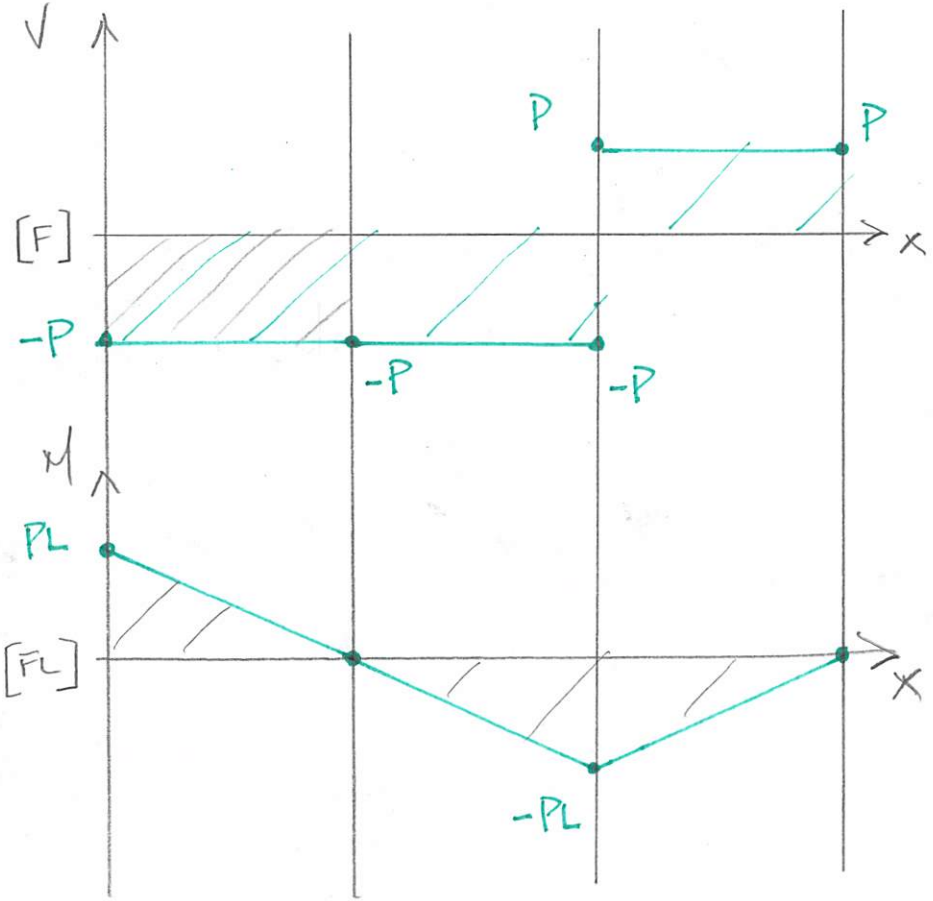
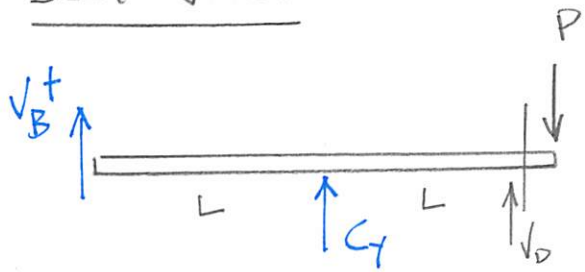
Example 7b-6: Use the conjugate beam method to determine the slope and displacement at point *D*. Assume that *EI* is constant.





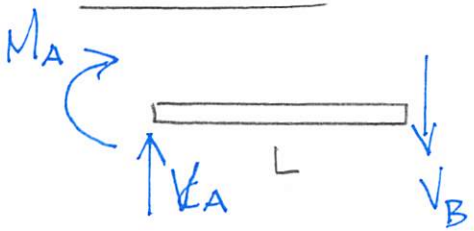
SECTION BCD



$$\circlearrowleft + \sum M_B = 0 = C_y(L) - P(2L) \qquad C_y = 2P$$

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

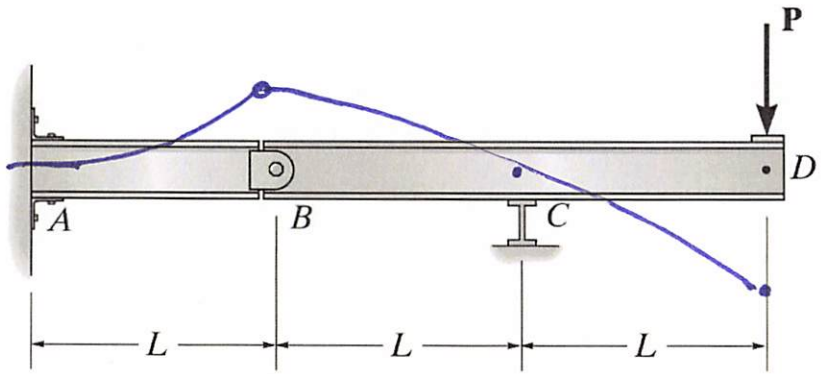
SECTION AB



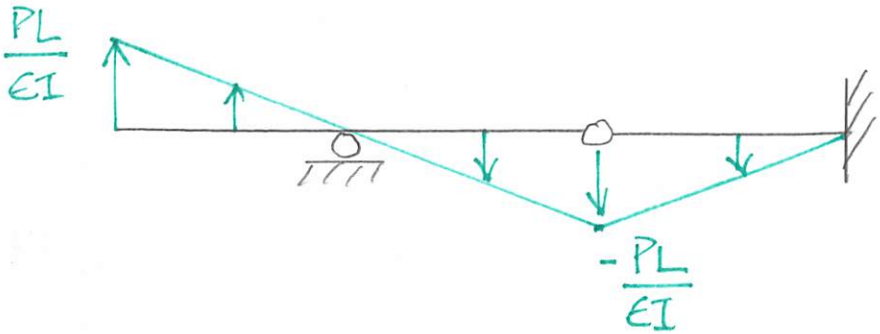
$$\circlearrowleft + \sum M_A = 0 = -M - V_B(L) \qquad M = PL$$

$$+\uparrow \sum F_y = 0 = V_A - V_B \qquad V_A = -P$$

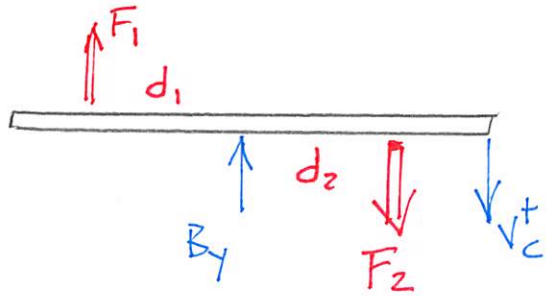
Example 7b-6: Use the conjugate beam method to determine the slope and displacement at point *D*. Assume that *EI* is constant.



CONJUGATE BEAM



SECTION ABC



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

$F_2 = F_1$

$d_1 = \frac{2}{3}(L) = \frac{2L}{3}$

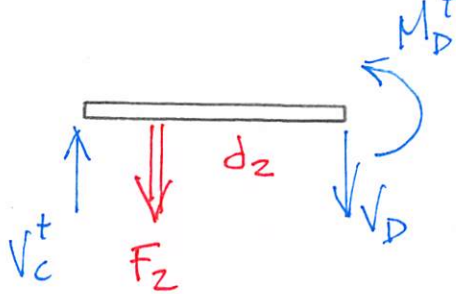
$d_2 = d_1$

$\circlearrowleft + \sum M_B = 0$

$= -F_1 d_1 - F_2 d_2 - V_c(L)$

$V_c = \left(\frac{-PL^3}{3EI} - \frac{PL^3}{3EI}\right)/L = -\frac{2PL^2}{3EI}$

SECTION CD



$\circlearrowleft + \sum M_D = 0$

$= M_D + F_2 d_2 - V_c(L)$

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

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