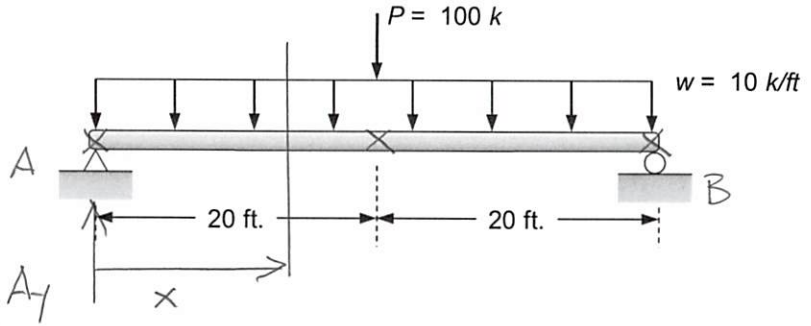
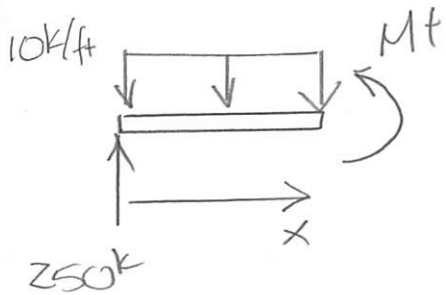
Classroom Problem 5.5-4: Determine C_b for a simply supported beam with lateral support at its ends and the middle.



$$\circlearrowleft^{+} \Sigma M_B = 0 = 10\,k/ft\,(40\,ft)(20\,ft) + 100^{k}(20\,ft) - A_y(40\,ft)$$

$$\underline{A_y = 250^{k}}$$



$$\circlearrowleft^{+} \Sigma M_{CUT} = 0 = \left[10x(x/2) - 250x + M\right] k\,ft$$

$$M(x) = \left[-5x^2 + 250x\right] k\,ft$$

$$M_A = M(x=5\,ft) = 1{,}125\,k\,ft \qquad M_B = M(x=10\,ft) = 2{,}000\,k\,ft$$

$$M_C = M(x=15\,ft) = 2{,}625\,ft \qquad M_{MAX} = M(x=20\,ft) = 3{,}000\,k\,ft$$

$$C_b = \frac{12.5(3)}{2.5(3) + 3(1.125) + 4(2) + 3(2.625)} = \underline{1.4019}$$