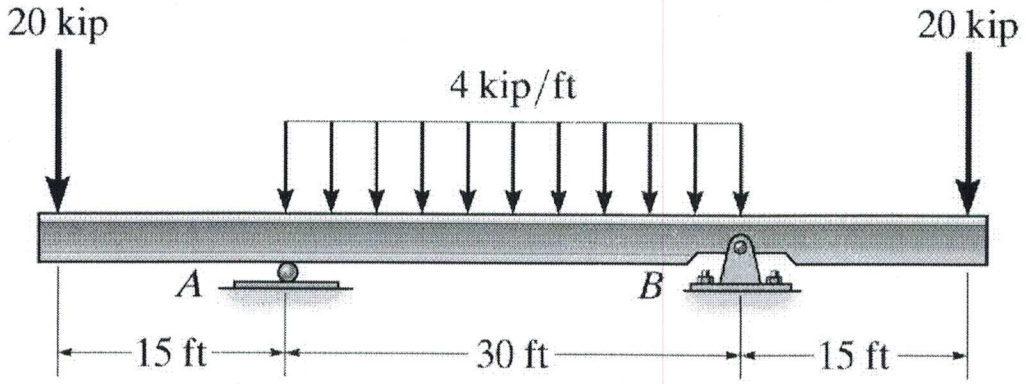
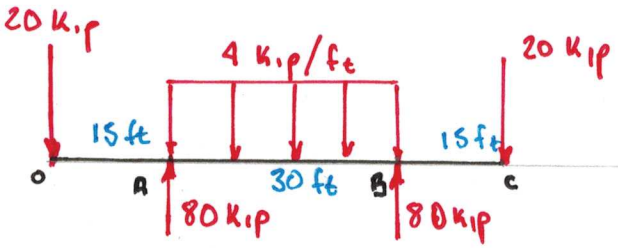
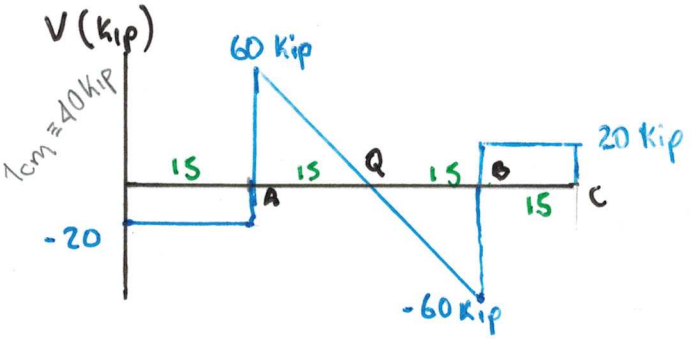
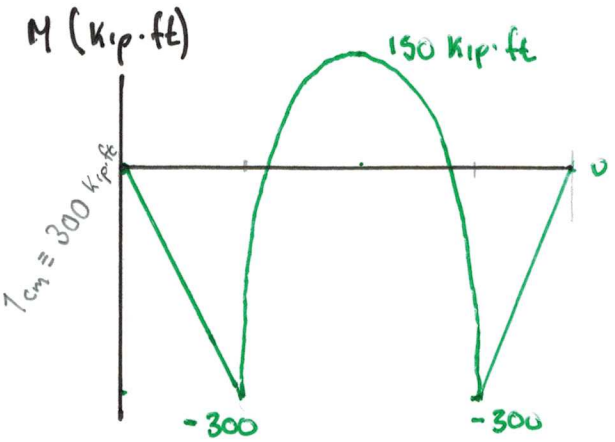
Draw the shear and moment diagrams for the beam.









$0 \le x \le 15$

$V_A = -20$ kip (constant)

$M_A - M_0 = \int_{x_0}^{x_A} V\,dx = -A_{OA}$ ← negative because area V is below x

$M_A = -(20 \times 15) = -300$ kip·ft

$15 \le x < 45$

$V_A = 80 - 20 = 60$ kip

$V_B - V_A = \int_{x_A}^{x_B} w(x)\,dx = -A_{AB}$ ← distributed load is negativ

$V_B = V_A - A_{AB} = 60 - (4 \times 30) = -60$ ki

$M_Q - M_A = \int_{x_A}^{x_Q} V\,dx = +A_{AQ}$ area above x axis

$M_Q = M_A + A_{AQ} = -300 + \frac{1}{2}(15)(60) = 150$ k

$M_B - M_Q = \int_{x_Q}^{x_B} V\,dx = -A_{QB}$ area below x axis

$M_B = M_Q - A_{QB} = 150 - \frac{1}{2}(15)(60) = -300$ kip

$45 \le x < 60$

$V_C = 80 - 60 = 20$ kip

$M_C - M_B = \int_{x_B}^{x_C} V\,dx = +A_{BC}$ area above x axis

$M_C = M_B + A_{BC} = -300 + (20 \cdot 15) = 0$ kip·ft