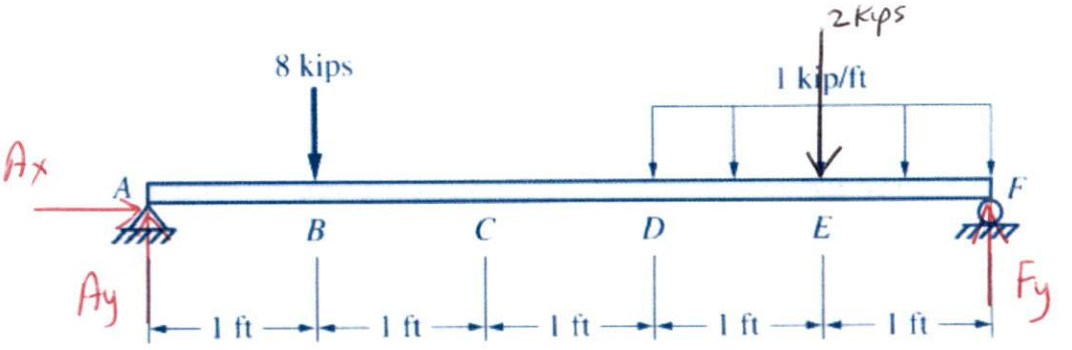
13-13

Determine the shear forces and bending moments at sections A, B, C, D, E, and F in Figs. P13-13 to P13-15.



Solution.

FBD

Equilibrium Equations

ccw +M ↺
cw −M ↻

$[\Sigma F_x = 0] \quad A_x = 0$

$[\Sigma M_A = 0] \quad -8\,\text{kips}(1\,\text{ft}) - 2\,\text{kips}(4\,\text{ft}) + F_y(5\,\text{ft}) = 0$

$F_y = \frac{16\ \text{kip.ft}}{5\,\text{ft}} = 3.2\ \text{kips} \uparrow$

$[\Sigma F_y = 0] \quad A_y - 8\,\text{kips} - 2\,\text{kips} + F_y = 0$

$A_y = 10\,\text{kips} - 3.2\,\text{kips} = 6.8\ \text{kips} \uparrow$

Shear Force (V)

$V_{A-} = 0$

$V_{A+} = +6.8\ \text{kips}$

$V_{B-} = 6.8\ \text{kips}$

$V_{B+} = 6.8\ \text{kips} - 8\ \text{kips} = -1.2\ \text{kips}$

$V_C = 6.8\ \text{kips} - 8\ \text{kips} = -1.2\ \text{kips}$

$V_D = 6.8\ \text{kips} - 8\ \text{kips} = -1.2\ \text{kips}$

$V_E = 6.8\ \text{kips} - 8\ \text{kips} - \frac{1\ \text{kip}}{\text{ft}}(1\,\text{ft}) = -2.2\ \text{kips}$

$V_{F-} = 6.8\ \text{kips} - 8\ \text{kips} - \frac{1\ \text{kip}}{\text{ft}}(2\,\text{ft}) = -3.2\ \text{kips}$

$V_{F+} = 6.8\ \text{kips} - 8\ \text{kips} - 1\ \text{kip/ft}(2\,\text{ft}) + 3.2\ \text{kips} = 0$

Bending Moment (M)

$M_A = 0$

$M_B = 6.8 \text{ Kip}(1 \text{ ft}) = +6.8 \text{ Kip.ft}$

$M_C = +6.8 \text{ Kip}(2 \text{ ft}) - 8 \text{ Kips}(1 \text{ ft}) = +5.6 \text{ Kip.ft}$

$M_D = +6.8 \text{ Kip}(3 \text{ ft}) - 8 \text{ Kip}(2 \text{ ft}) = +4.4 \text{ Kip.ft}$

$M_E = +6.8 \text{ Kip}(4 \text{ ft}) - 8 \text{ Kip}(3 \text{ ft}) - 1 \frac{\text{Kip}}{\text{ft}}(1 \text{ ft})(0.5 \text{ ft}) = +2.7 \text{ Kip.ft}$

$M_F = 0$ (from Right)