Construct a complete shear force and bending moment diagram for the following beam.
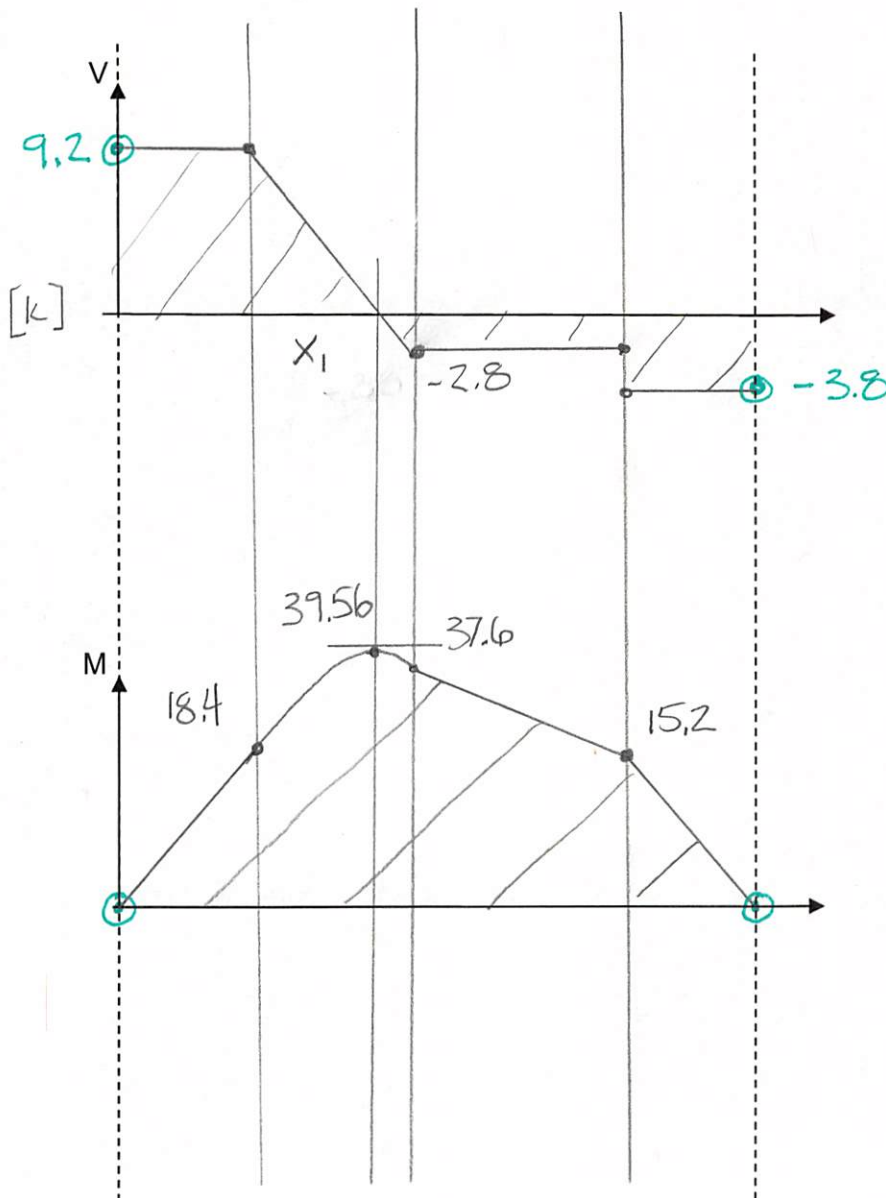

2 k/ft   1 k

A   B

12^k $3'$

V_A^+ ← 2 ft → ← 6 ft → ← 8 ft → ← 4 ft → V_B^+
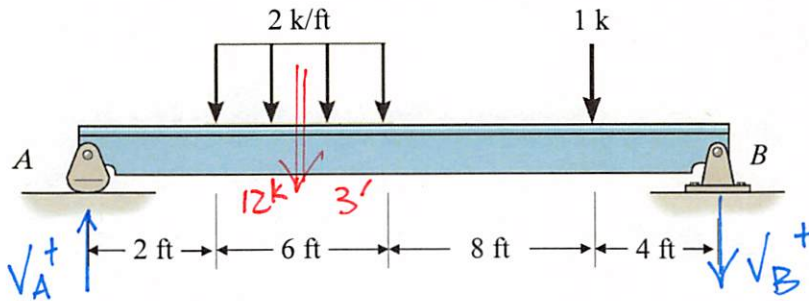
$\circlearrowright \Sigma M_B = 0 = 1^k(4') + 12^k(15')$

$- V_A(20')$

$\underline{V_A = 9.2 k}$

$+\uparrow \Sigma F_y = 0 = V_A - V_B - 1^k - 12^k$

$\underline{V_B = -3.8^k}$

$\Delta V = \int w\,dx \qquad \dfrac{dV}{dx} = V$

$X_1 = \dfrac{9.2 k}{2 k/ft} = \underline{4.6 ft}$

$\Delta M = \int V\,dx \qquad \dfrac{dM}{dx} = V$

V

9.2

[k]

X_1

−2.8

⊕ −3.8

39.56   37.6

M

18.4   15.2

a) What is the maximum bending moment, and where does it occur? $\underline{39.56\,kft \; @ \; x = 6.6'}$

b) What is the maximum shear force, and where does it occur? $\underline{9.2k \; @ \; A}$

c) What is the slope of the bending moment diagram at $x = 8$ ft? $\underline{-2.8k}$