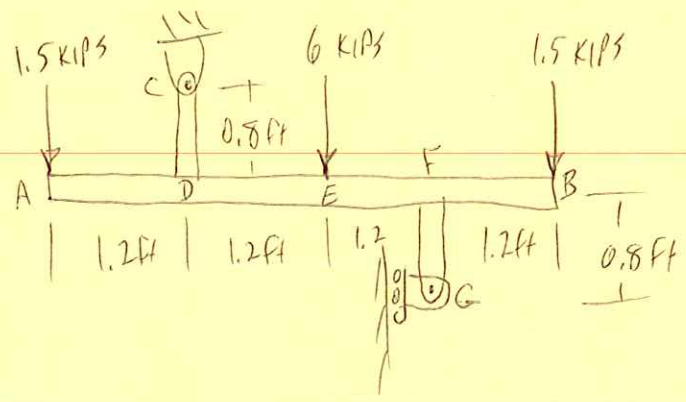


EXAMPLE PROB. 7.53

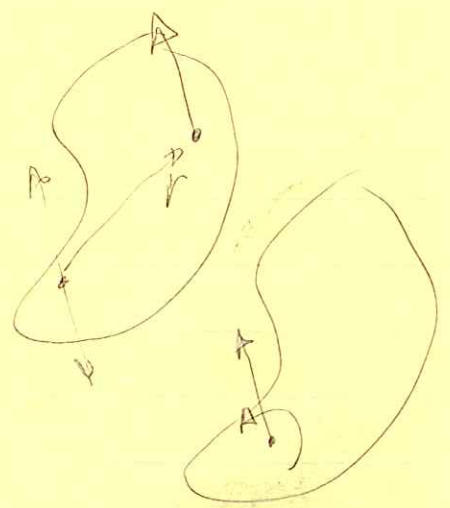
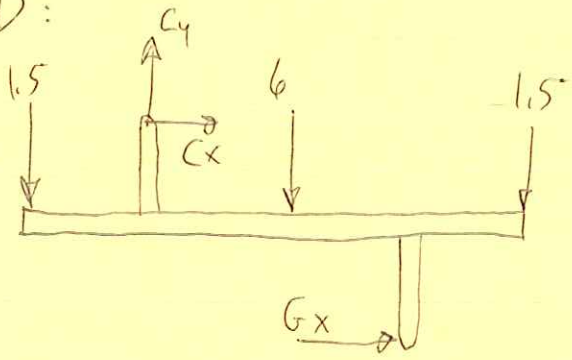
Given: Schematics with loading

Find:

DRAW SHEAR + BENDING-MOMENT DIAGRAMS, FIND MAXIMUMS.



FBD:



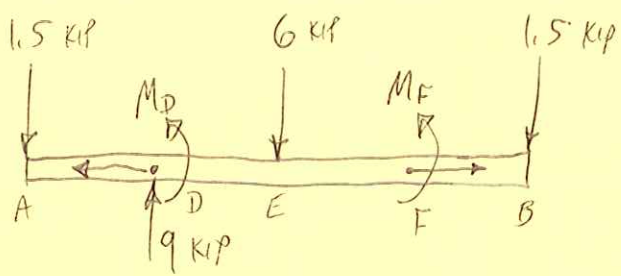
$$\sum F_y = 0 : -1.5 + C_y - 6 - 1.5 = 0 : C_y = 9 \text{ kips}$$

$$\sum M_c = 0 \quad (+\curvearrowright) : (1.2 \text{ ft})(1.5 \text{ kips}) - (1.2)(6) + (1.6)G_x - (3.6)(1.5) = 0$$

$$G_x = 6.75 \text{ kips}$$

$$\sum F_x = 0 : C_x + G_x = 0 \quad C_x = -6.75 \text{ kips}$$

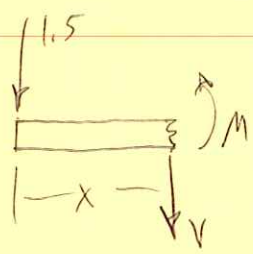
FBD: REPLACE  $\vec{C}$  +  $\vec{G}$  WITH FORCE COUPLE SYSTEMS.



$$M_D = (6.75 \text{ KIP})(0.8 \text{ FT}) = 5.4 \text{ FT-KIP}$$

$$M_F = 5.4 \text{ KIP-FT}$$

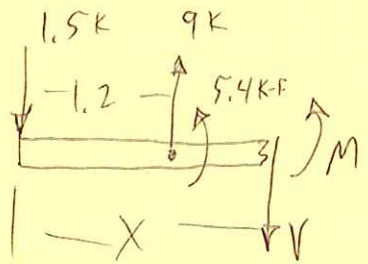
FBD A TO D: (OMIT AXIAL FORCES)  $x = 0^+$  TO  $1.2^-$  FT



$$\sum F_y = 0 : -1.5 - V = 0, \quad \boxed{V = -1.5 \text{ KIP}}$$

$$\sum M = 0 \uparrow : M + 1.5x = 0, \quad \boxed{M = -1.5x \text{ FT-KIP}}$$

FBD A TO E:  $x = 1.2^+$  TO  $2.4^-$  FT



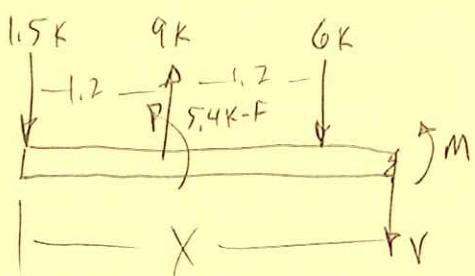
$$\sum F_y = 0 : -1.5 + 9 - V = 0$$

$$\boxed{V = 7.5 \text{ KIP}}$$

$$\sum M = 0 \uparrow : M - 9(x - 1.2) + 1.5x + 5.4 = 0$$

$$\boxed{M = 7.5x - 16.2 \text{ FT-KIP}}$$

FBD A TO F:  $x = 2.4^+$  TO  $3.6^-$  FT



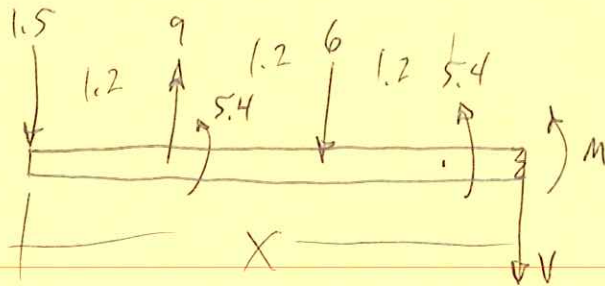
$$\sum F_y = 0 : -1.5 + 9 - 6 - V = 0$$

$$\boxed{V = 1.5 \text{ KIP}}$$

$$\sum M = 0 \uparrow : M + 6(x - 2.4) - 9(x - 1.2) + 5.4 + 1.5(x) = 0$$

$$\boxed{M = 1.5x - 1.8 \text{ FT-KIP}}$$

FBD A TO B :  $x = 3.6^+$  TO  $4.8^-$  ft



$$\sum F_y = 0 : V = 1.5 \text{ kIP}$$

$$\sum M = 0 \text{ (+)} : M + 5.4 + 6(x - 2.4) - 9(x - 1.2) + 5.4 + 1.5(x) = 0$$

$$M = 1.5x - 7.2 \text{ kft-kIP}$$

$$x = 0^+ : V = -1.5, M = 0$$

$$x = 1.2^- : V = -1.5, M = -1.8$$

$$x = 1.2^+ : V = 7.5, M = -7.2$$

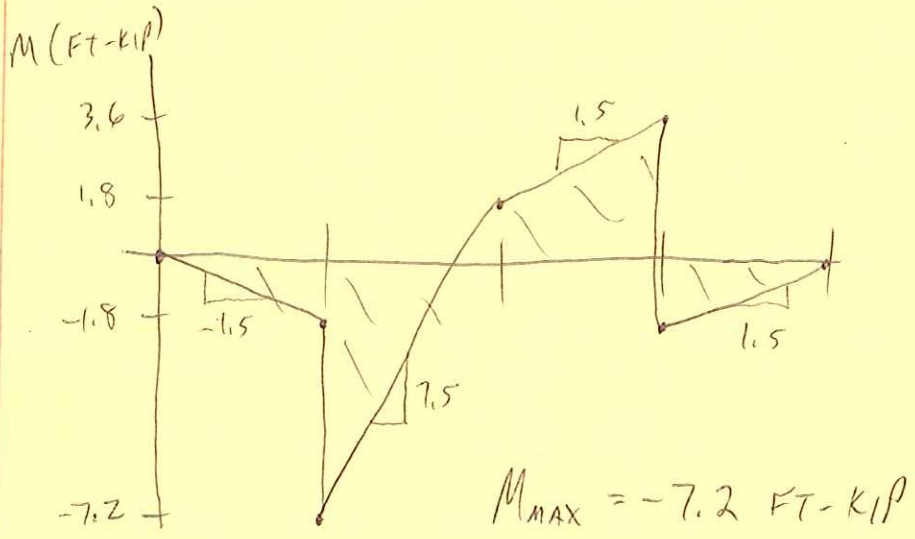
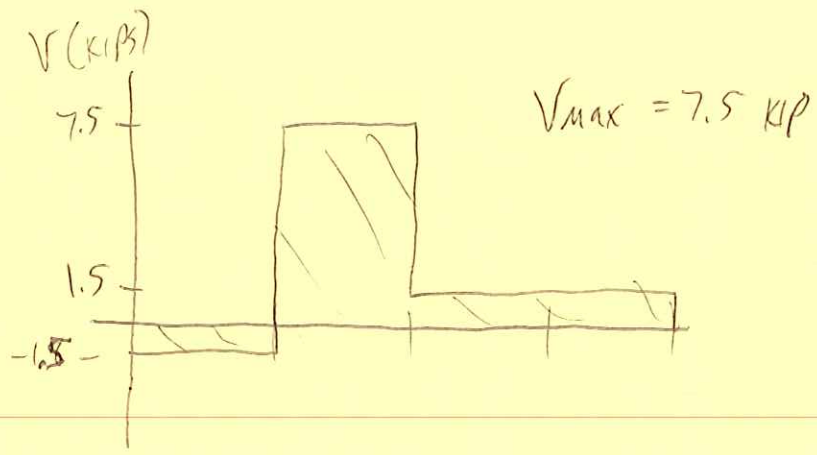
$$x = 2.4^- : V = 7.5, M = 1.8$$

$$x = 2.4^+ : V = 1.5, M = 1.8$$

$$x = 3.6^- : V = 1.5, M = 3.6$$

$$x = 3.6^+ : V = 1.5, M = -1.8$$

$$x = 4.8^- : V = 1.5, M = 0$$



LET'S LOOK AT THE SLOPE OF M:

$V = \frac{dM}{dx}$  EXCEPT WHERE COUPLES ARE APPLIED

INTEGRATING GIVES

$M_2 - M_1 = \int_{x_1}^{x_2} V dx = \text{AREA UNDER SHEAR CURVE}$