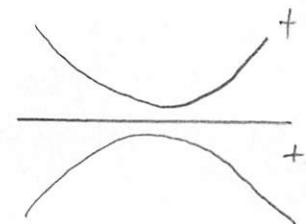
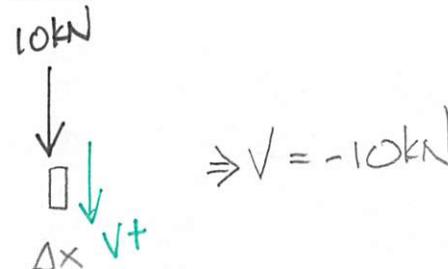
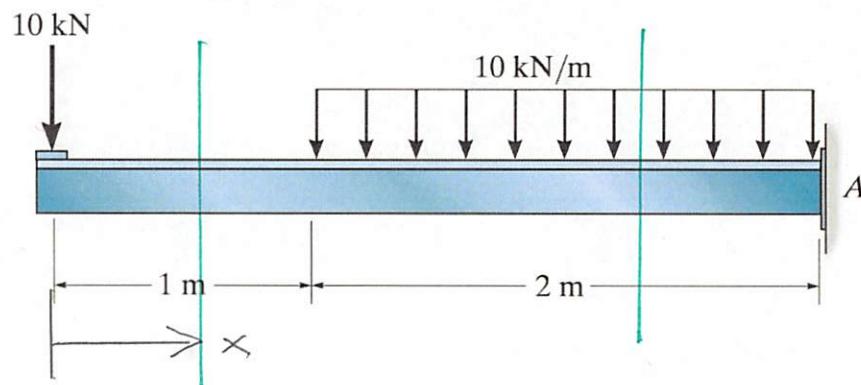


Example 4b-3 - Determine the internal shear and bending moment as a function of  $x$ .



$$M(x=0) = 0 \quad \checkmark$$

$$\begin{aligned} & 0 \leq x \leq 1 \\ & \text{Free body diagram: } \begin{array}{c} 10 \text{ kN} \\ \downarrow \\ \text{Horizontal bar} \\ \rightarrow x \end{array} \quad \begin{array}{l} M^+ \\ V^+ \end{array} \\ & \sum M_{\text{cut}} = 0 = M + 10 \text{ kN}(x) \\ & + \uparrow \sum F_y = 0 = -V - 10 \text{ kN} \end{aligned}$$

$$\begin{aligned} M_I &= \underline{\underline{[-10x] \text{ kNm}}} \\ V_I &= \underline{\underline{-10 \text{ kN}}} \quad \frac{dM}{dx} = V \\ \frac{dM}{dx} &= V \quad \checkmark \end{aligned}$$

$$\begin{aligned} & 1 \leq x \leq 3 \\ & \text{Free body diagram: } \begin{array}{c} 10 \text{ kN} \\ 10 \text{ kN/m} \\ \downarrow \\ \text{Horizontal bar} \\ \leftarrow x-1 \quad \rightarrow x \end{array} \quad \begin{array}{l} F \\ d \\ M^+ \\ V^+ \end{array} \\ & F = 10(x-1) \quad d = \frac{1}{2}(x-1) \end{aligned}$$

$$\begin{aligned} & \sum M_{\text{cut}} = 0 = M_I + 10(x-1)\left(\frac{x-1}{2}\right) + 10x \\ & M_I = \underline{\underline{[-5(x-1)^2 - 10x] \text{ kNm}}} \quad M_I(x=1) = M_{II}(x=1) \\ & + \uparrow \sum F_y = 0 = -V - 10(x-1) - 10 \text{ kN} \\ & V_{II} = \underline{\underline{[-10(x-1) - 10] \text{ kN}}} \quad V_I(x=1) = V_{II}(x=1) \quad \checkmark \end{aligned}$$