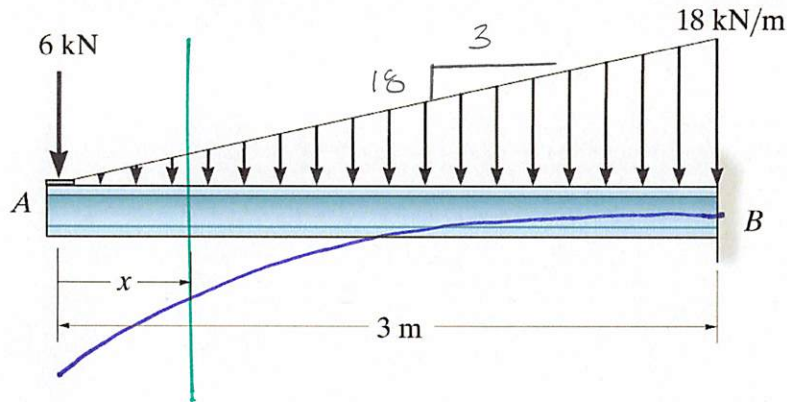


Example 4b-1 - Determine the internal shear and bending moment as a function of x .

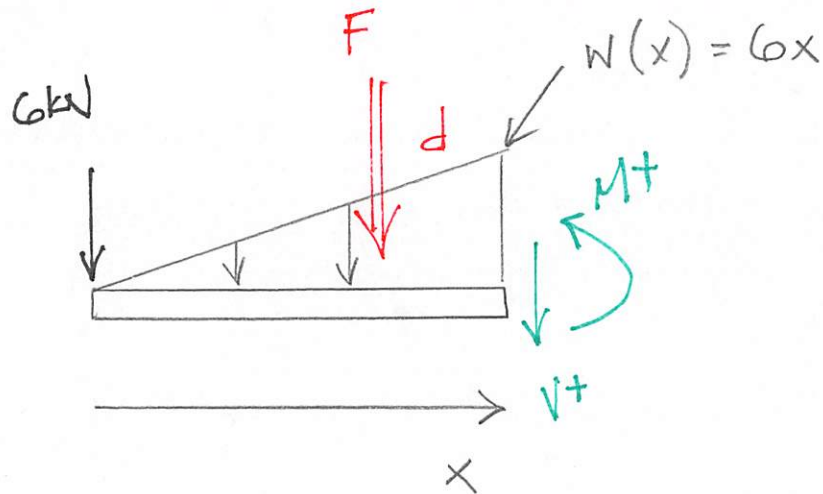


Free body diagram of a small element of length Δx at the left end of the beam:

$$\uparrow \sum F_y = 0 = -V - 6 \text{ kN}$$

$$\underline{V = -6 \text{ kN}}$$

$\Delta x \rightarrow 0$



$$\uparrow \sum M_{\text{cut}} = 0 = M + 3x^2 \left(\frac{x}{3} \right) + 6x$$

$$\underline{M = [-x^3 - 6x] \text{ kNm}}$$

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

$$M(x=3) = ?$$

$$\uparrow \sum F_y = 0 = -V - 3x^2 - 6 \text{ kN}$$

$$\underline{V = [-3x^2 - 6] \text{ kN}}$$

$$V(x=0) = -6 \text{ kN} \quad \checkmark$$

$$V(x=3\text{m}) = V_B$$

$$\underline{0 \leq x \leq 3\text{m}}$$

$$F = \frac{1}{2}(x) 6x = 3x^2$$

$$d = \frac{1}{3}(x) = \frac{x}{3}$$

$$\frac{dM}{dx} = V \quad \checkmark$$