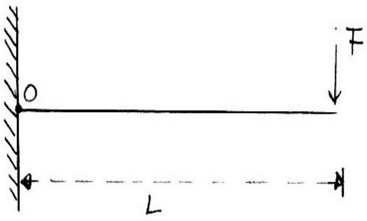
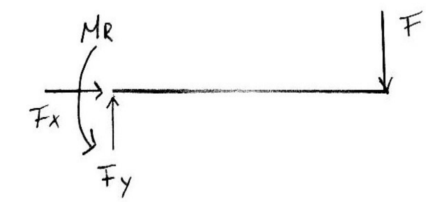
Problemas del cálculo de fuerzas internas mediante el método de integración.

P1)

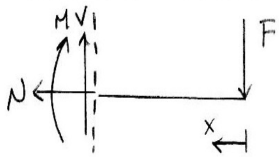


dcl:

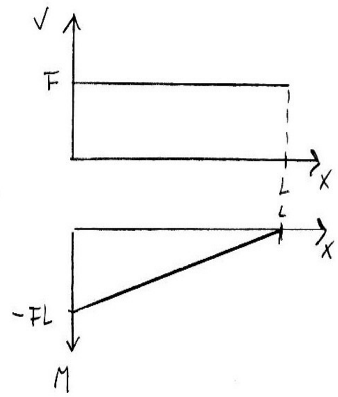


$$\sum F_x = 0 \Rightarrow F_x = 0 \; ; \; \sum F_y = 0 \Rightarrow F_y = F \; ; \; \sum M_0 = 0 \Rightarrow M_R = FL$$

→ Método directo:



$$\sum F_x = 0 \Rightarrow N = 0$$
$$\sum F_y = 0 \Rightarrow V = F$$
$$\sum M_C = 0 \Rightarrow M = -FL$$



→ Método de la integral:

$$\frac{dV(x)}{dx} = q(x) = 0 \Rightarrow V(x) = cte \qquad 0 \leq x \leq L$$

*condición de borde

$V(x=0) = F$

$\Rightarrow \boxed{V(x) = F} \; \forall x$

$$\frac{dM(x)}{dx} = -V(x) \Rightarrow M(x) = -\int V(x)dx + cte$$

$$\Rightarrow M(x) = -Fx + C_1$$

*condición de borde

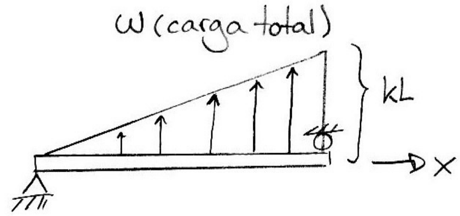
$M(x=L) = -FL$

$\Rightarrow -FL + C_1 = -FL$

$\Rightarrow C_1 = 0$

$$\Rightarrow \boxed{M(x) = -Fx}$$

P2



$$W = kL \cdot \frac{L}{2} = \frac{kL^2}{2}$$

$$\Rightarrow k = \frac{2W}{L^2}$$

$$p(x) = kx = \frac{2Wx}{L^2}$$

$$\frac{d^2M}{dx^2} = p(x) = kx \qquad k>0 \quad \Rightarrow \quad \frac{dM(x)}{dx} = \frac{kx^2}{2} + C_1$$

$$\Rightarrow M(x) = \frac{kx^3}{6} + C_1 x + C_2.$$

$$\left.\begin{array}{l} M(x=0) = 0 \Rightarrow C_2 = 0 \\ M(x=L) = 0 \Rightarrow C_1 = -\frac{kL^2}{6}. \end{array}\right\} \Rightarrow \boxed{M(x) = \frac{kx^3}{6} - \frac{kL^2}{6}x}$$

$$V(x) = -\frac{dM(x)}{dx} = -\left(\frac{kx^2}{2}\right) + \left(\frac{kL^2}{6}\right) \Rightarrow \boxed{V(x) = \frac{k}{6}(L^2 - 3x^2)}$$

$$\Rightarrow \boxed{\begin{array}{l} M(x) = \frac{Wx}{3L^2}(x^2 - L^2) \\ \\ V(x) = \frac{W}{3L^2}(L^2 - 3x^2) \end{array}}$$