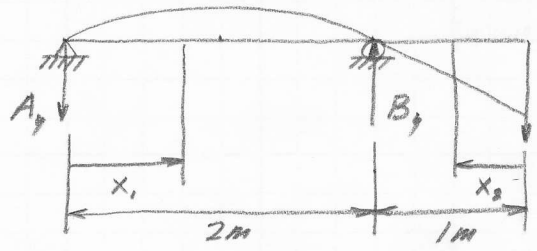
(12-5)




$\Sigma M_A = 0,\ (2m)(B_y) - (3m)6\,kN = 0$

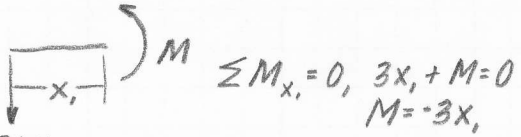
$B_y = 9\,kN$

$\Sigma F_y = 0,\ -A_y + 9\,kN - 6\,kN = 0$

$A_y = 3\,kN$

$E = 200 \times 10^6 \frac{kN}{m^2}$

$I = \frac{1}{4}\pi r^4 = \frac{1}{4}\pi (0.050m)^4 = 4.9087 \times 10^{-6} m^4$



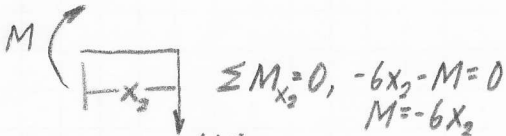

$\Sigma M_{x_1} = 0,\ 3x_1 + M = 0$

$M = -3x_1$

$\frac{d^2v_1}{dx_1^2} = \frac{1}{EI}(-3x_1)$

$\frac{dv_1}{dx_1} = \frac{1}{EI}\left(\frac{-3x_1^2}{2} + C_1\right)$

$v_1 = \frac{1}{EI}\left(\frac{-3x_1^3}{(2)(3)} + C_1x_1 + C_2\right)$




$\Sigma M_{x_2} = 0,\ -6x_2 - M = 0$

$M = -6x_2$

$\frac{d^2v_2}{dx_2} = \frac{1}{EI}(-6x_2)$

$\frac{dv_2}{dx_2} = \frac{1}{EI}\left(\frac{-6x_2^2}{2} + C_3\right)$

$v_2 = \frac{1}{EI}\left(\frac{-6x_2^3}{(2)(3)} + C_3x_2 + C_4\right)$

@ $x_1 = 0,\ v_1 = 0 \longrightarrow C_2 = 0$

@ $x_1 = 2m,\ v_1 = 0 \longrightarrow 0 = \left(\frac{-(2)^3}{2} + C_1(2)\right)$

$2C_1 = 4$

$C_1 = 2$

@ $x_2 = 1m,\ v_2 = 0 \longrightarrow 0 = \left(-(1)^3 + C_3(1) + C_4\right)$

$C_3 + C_4 = 1$

@ $x_1 = 2m$ & $x_2 = 1m$

$\frac{dv_2}{dx_2} = -\frac{dv_1}{dx_1}$

$\frac{1}{EI}\left(-3(1)^2 + C_3\right) = -\frac{1}{EI}\left(\frac{-3}{2}(2)^2 + 2\right)$

$-3 + C_3 = -(-6 + 2)$

$C_3 = 7$

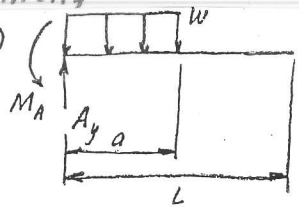
$C_4 = 1 - C_3 = 1 - (7) = -6$

$V_2$ @ C = $V_2$ @ $x_2 = 0$: $\quad v_2 = \frac{1}{EI}\left(-x_2^3 + (-1)x_2 - 6\right)$

$= \frac{1}{\left(200 \times 10^6 \frac{kN}{m^2}\right)(4.9087 \times 10^{-6} m^4)}\left(-(0)^3 + (-1)(0) - 6\right)$

$= -6.112 \times 10^{-3}\,m$ or $\boxed{-6.11\,mm}$

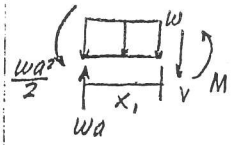
**12-29**




$\sum M_A = 0, \quad M_A - \frac{a}{2}wa = 0 \rightarrow M_A = \frac{wa^2}{2}$

$\sum F_y = 0, \quad A_y - wa = 0 \rightarrow A_y = wa$

$0 \le x_1 < a$




$\sum M_{x_1} = 0,$

$\frac{wa^2}{2} - wax_1 + \frac{x_1}{2}wx_1 + M = 0$

$M = -\frac{wx_1^2}{2} + wax_1 - \frac{wa^2}{2}$

$\frac{d^2v_1}{dx_1^2} = \frac{1}{EI}\left(-\frac{wx_1^2}{2} + wax_1 - \frac{wa^2}{2}\right)$

$\frac{dv_1}{dx_1} = \frac{1}{EI}\left(-\frac{wx_1^3}{6} + \frac{wax_1^2}{2} - \frac{wa^2x_1}{2} + C_1\right)$

$v_1 = \frac{1}{EI}\left(-\frac{wx_1^4}{24} + \frac{wax_1^3}{6} - \frac{wa^2x_1^2}{4} + C_1x_1 + C_2\right)$

@ $x_1 = 0, \quad \frac{dv_1}{dx_1} = 0$ & $v_1 = 0$

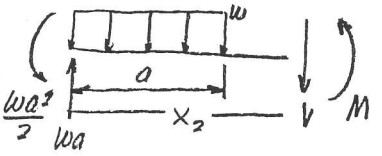
$C_1 = 0$

$C_2 = 0$

$\frac{dv_1}{dx_1} = \frac{wx_1}{6EI}(-x_1^2 + 3ax_1 - 3a^2)$

$\boxed{v_1 = \frac{wx_1^2}{24EI}(-x_1^2 + 4ax_1 - 6a^2)}$

$a < x_2 \le L$




$\sum M_{x_2} = 0$

$\frac{wa^2}{2} - wax_2 + \left(x_2 - \frac{a}{2}\right)wa + M = 0$

$M = -\frac{wa^2}{2} + wax_2 - wax_2 + \frac{wa^2}{2}$

$M = 0$

$\frac{d^2v_2}{dx_2^2} = \frac{1}{EI}(0)$

$\frac{dv_2}{dx_2} = \frac{1}{EI}(C_3)$

$v_2 = \frac{1}{EI}(C_3x_2 + C_4)$

@ $x_1 = a$ & $x_2 = a$

$\frac{dv_1}{dx_1} = \frac{dv_2}{dx_2}$

$\frac{wa}{6EI}(-a^2 + 3a^2 - 3a^2) = \frac{1}{EI}C_3$

$C_3 = -\frac{wa^3}{6}$

$v_1 = v_2$

$\frac{wa^2}{24EI}(-a^3 + 4a^3 - 6a^3) = \frac{1}{EI}\left(-\frac{wa^4}{6} + C_4\right)$

$C_4 = -\frac{3wa^4}{24} + \frac{wa^4}{6} = \frac{wa^4}{24}$

$v_2 = \frac{1}{EI}\left(-\frac{wa^3}{6}x_2 + \frac{wa^4}{24}\right)$

$\boxed{v_2 = \frac{wa^3}{24EI}(-4x_2 + a)}$

@ $x_2 = L,$ $\boxed{\frac{dv_2}{dx_2} = \frac{-wa^3}{6EI}}$ $\boxed{v_2 = \frac{wa^3}{24EI}(-4L + a)}$