Remarks: See §2.7, pages 45 till 51

Answers 2.50-1:

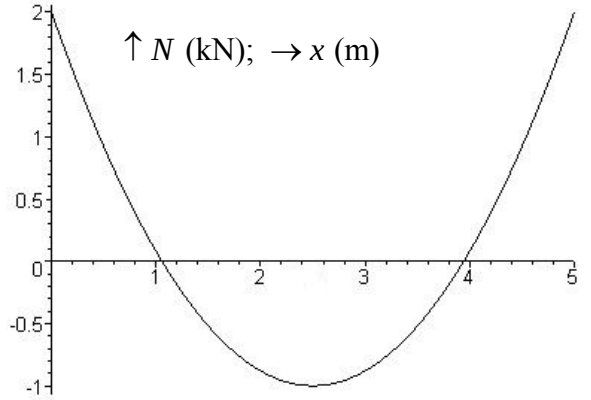
a. $N = +(0,48\ \text{kN/m}^2)x^2 - (2,4\ \text{kN/m})x + (2\ \text{kN})$

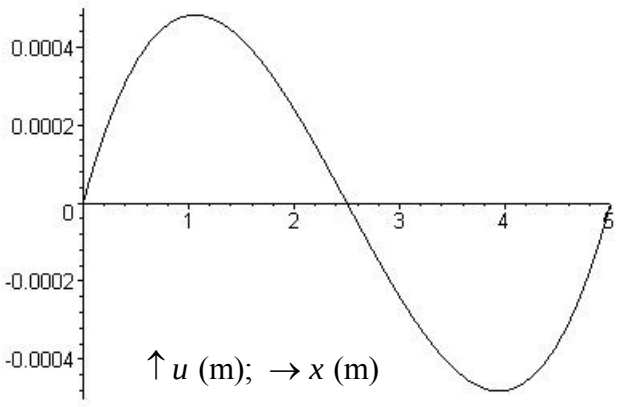
$u = \left\{+(0,08\ \text{m}^{-2})x^3 - (0,6\ \text{m}^{-1})x^2 + x\right\} \times 10^{-3}$

b. See the figures to the right

c. $N_A = N_B = +2\ \text{kN} \Rightarrow A_h = 2\ \text{kN} \leftarrow$

$B_h = 2\ \text{kN} \rightarrow$





Explanation:

$$q = -\frac{2\hat{q}}{\ell}x + \hat{q}$$

$$EAu'' = -q = +\frac{2\hat{q}}{\ell}x - \hat{q}$$

$$N = EAu' = +\frac{\hat{q}}{\ell}x^2 - \hat{q}x + C_1$$

$$EAu = +\frac{\hat{q}}{3\ell}x^3 - \frac{\hat{q}}{2}x^2 + C_1 x + C_2$$

$$x = 0;\ u = 0 \Rightarrow C_2 = 0$$

$$x = \ell = 5\ \text{m};\ u = 0 \Rightarrow C_1 = \tfrac{1}{6}\hat{q}\ell = 2\ \text{kN}$$

Remarks: See §2.7, pages 45 till 51

Answers 2.50-2:

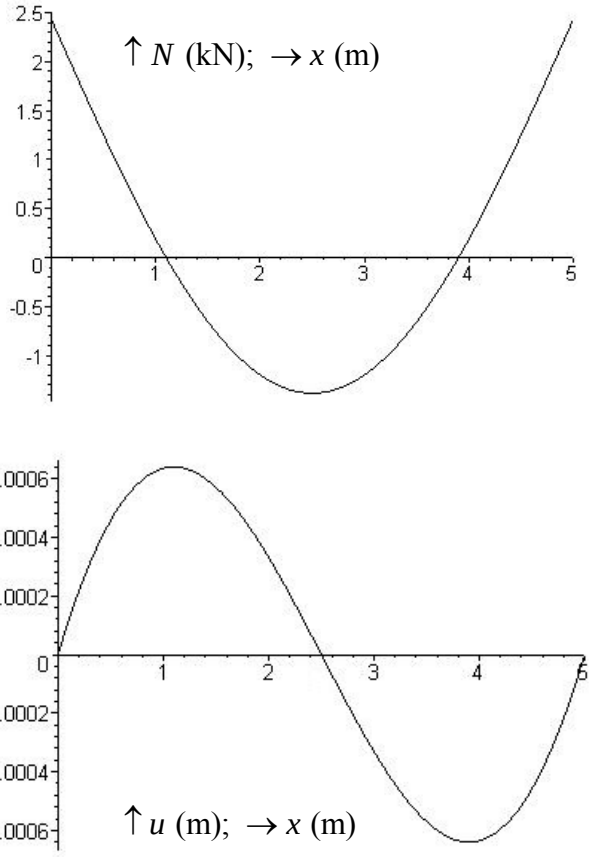
a. $N = \left(-\frac{12}{\pi} \sin \frac{\pi x}{(5\text{ m})} + \frac{24}{\pi^2} \right)$ kN

$u = +\frac{30 \times 10^{-3}}{\pi^2} \left(\cos \frac{\pi x}{(5\text{ m})} + \frac{2x}{(5\text{ m})} - 1 \right)$ m

b. See the figures to the right

c. $N_A = N_B = \frac{24}{\pi^2}$ kN $\Rightarrow A_h = 2,43$ kN $\leftarrow$

$B_h = 2,43$ kN $\rightarrow$



Explanation:

$EAu'' = -q = -\hat{q} \cos \frac{\pi x}{\ell}$

$N = EAu' = -\frac{\hat{q}\ell}{\pi} \sin \frac{\pi x}{\ell} + C_1$

$EAu = +\frac{\hat{q}\ell^2}{\pi^2} \cos \frac{\pi x}{\ell} + C_1 x + C_2$

$x = 0;\ u = 0 \Rightarrow C_2 = -\frac{\hat{q}\ell^2}{\pi^2} = -\frac{60}{\pi^2}$ kNm

$x = \ell = 5$ m; $u = 0 \Rightarrow C_1 = \frac{2\hat{q}\ell}{\pi^2} = \frac{24}{\pi^2}$ kN

Remarks: See §2.7, pages 45 till 51

Answers 2.50-3:

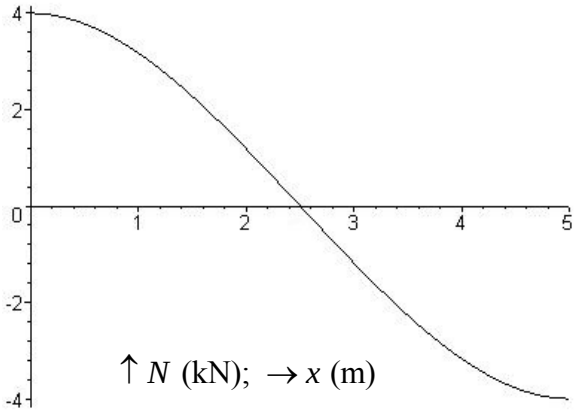
a. $N = +(0{,}128\ \text{kN/m}^3)x^3 - (0{,}960\ \text{kN/m}^2)x^2 + (4\ \text{kN})$

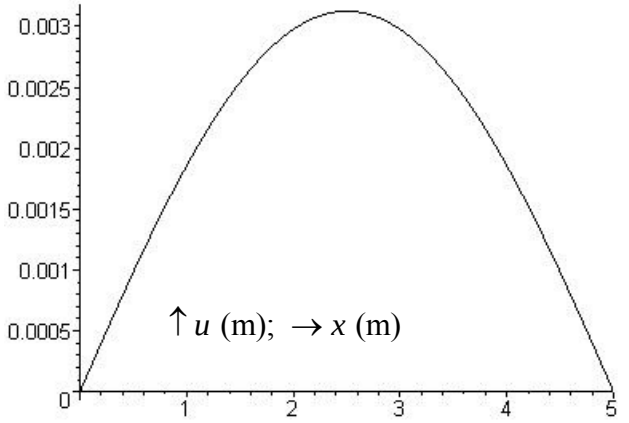
$u = \left\{+(0{,}016\ \text{m}^{-3})x^4 - (0{,}16\ \text{m}^{-2})x^3 + 2x\right\} \times 10^{-3}$

b. See the figures to the right

c. $N_A = +4\ \text{kN} \Rightarrow A_h = 4\ \text{kN} \leftarrow$

$N_B = -4\ \text{kN} \Rightarrow B_h = 4\ \text{kN} \leftarrow$





Explanation:

$$q = -\frac{4\hat{q}}{\ell^2}x^2 + \frac{4\hat{q}}{\ell}x$$

$$EAu'' = -q = +\frac{4\hat{q}}{\ell^2}x^2 - \frac{4\hat{q}}{\ell}x$$

$$N = EAu' = +\frac{4\hat{q}}{3\ell^2}x^3 - \frac{2\hat{q}}{\ell}x^2 + C_1$$

$$EAu = +\frac{\hat{q}}{3\ell^2}x^4 - \frac{2\hat{q}}{3\ell}x^3 + C_1 x + C_2$$

$$x = 0;\ u = 0 \Rightarrow C_2 = 0$$

$$x = \ell = 5\ \text{m};\ u = 0 \Rightarrow C_1 = \tfrac{1}{3}\hat{q}\ell = 4\ \text{kN}$$

Remarks: See §2.7, pages 45 till 51

Answers 2.50-4:

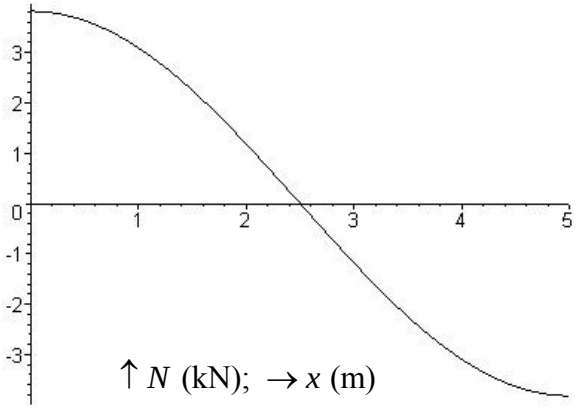
a. $N = \dfrac{12}{\pi}\cos\dfrac{\pi x}{(5\text{ m})}$ kN

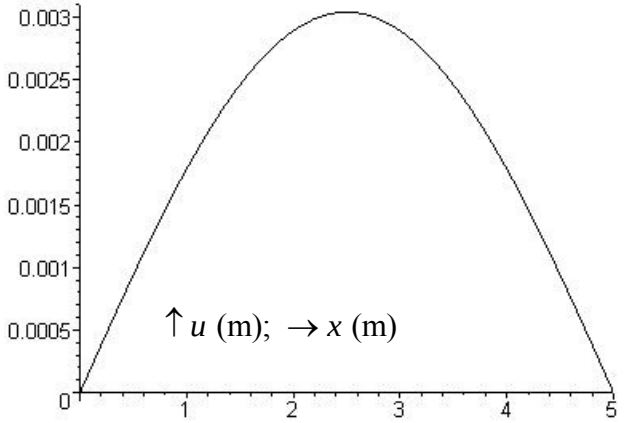
$u = +\dfrac{30\times10^{-3}}{\pi^2}\sin\dfrac{\pi x}{(5\text{ m})}$ m

b. See the figures to the right

c. $N_{\text{A}} = +\dfrac{12}{\pi}$ kN $\Rightarrow$ $A_{\text{h}} = 3{,}82$ kN $\leftarrow$

$N_{\text{B}} = -\dfrac{12}{\pi}$ kN $\Rightarrow$ $B_{\text{h}} = 3{,}82$ kN $\leftarrow$





Explanation:

$EAu'' = -q = -\hat{q}\sin\dfrac{\pi x}{\ell}$

$N = EAu' = +\dfrac{\hat{q}\ell}{\pi}\cos\dfrac{\pi x}{\ell} + C_1$

$EAu = +\dfrac{\hat{q}\ell^2}{\pi^2}\sin\dfrac{\pi x}{\ell} + C_1 x + C_2$

$x = 0;\ u = 0 \Rightarrow C_2 = 0$

$x = \ell = 5\text{ m};\ u = 0 \Rightarrow C_1 = 0$