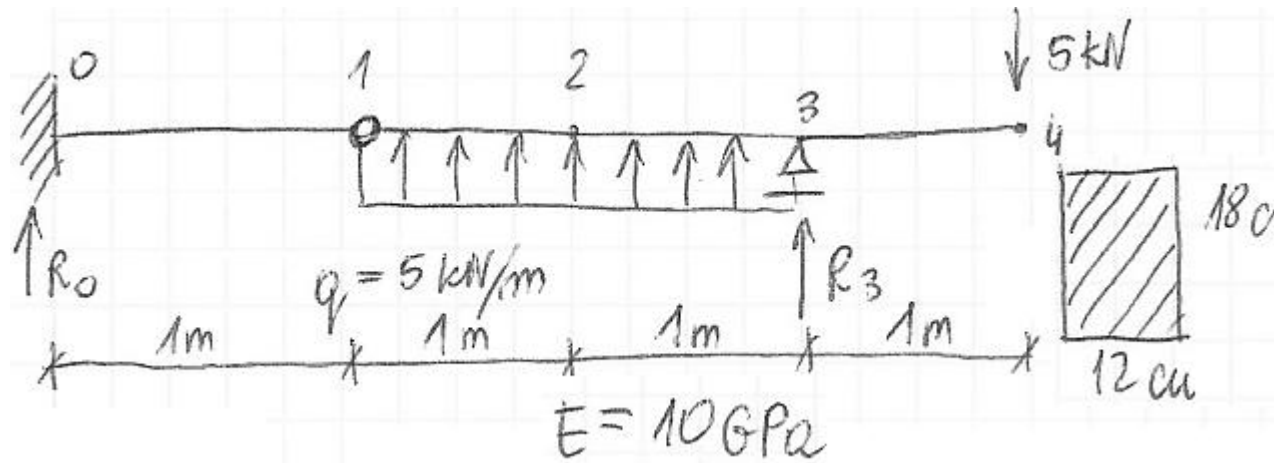


## Ugięcie belki obliczone Metodą Różnic Skończonych

ORIGIN := 0



$$P := 5 \text{ kN} \quad q := 5 \frac{\text{kN}}{\text{m}}$$

$$L := 4 \text{ m} \quad b := 12 \text{ cm} \quad h := 18 \text{ cm} \quad J := b \cdot \frac{h^3}{12} \quad E := 10 \text{ GPa}$$

$$T1 := \frac{-q \cdot 2 \text{ m} \cdot 1 \text{ m} - P \cdot 1 \text{ m}}{2 \text{ m}} = -7.5 \cdot \text{kN} \quad R0 := T1 \quad R3 := -q \cdot 2 \text{ m} + P - T1 = 2.5 \text{ kN}$$

$$M0 := -T1 \cdot 1 \text{ m} \quad M0 = 7.5 \cdot \text{kN} \cdot \text{m} \quad R0 = -7.5 \cdot \text{kN}$$

$$n := 4 \quad \Delta := \frac{L}{n} = 1 \text{ m} \quad \alpha := \frac{\Delta^2}{E \cdot J} \quad \alpha = 1.715 \times 10^{-3} \cdot \frac{1}{\text{kN}}$$

$$M1(x) := R0 \cdot x + M0$$

$$M2(x) := M1(x) + q \cdot \frac{(x - 1\text{m})^2}{2}$$

$$M3(x) := M2(x) + R3 \cdot (x - 3\text{m}) - q \cdot \frac{(x - 3\text{m})^2}{2}$$

$$i := 0..n$$

$$X_i := i \cdot \Delta$$

$$i := 0..1 \quad M_i := M1(X_i)$$

$$i := 1..3 \quad M_i := M2(X_i)$$

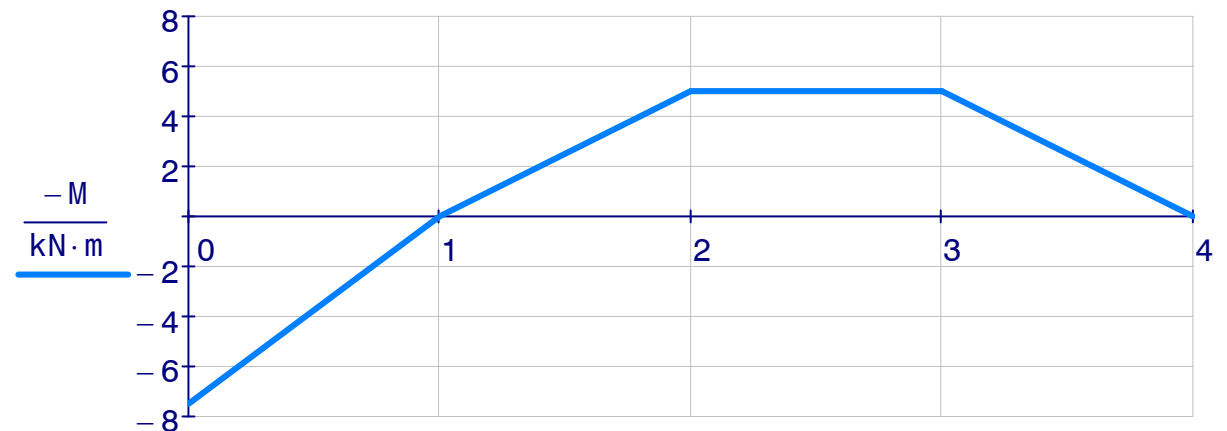
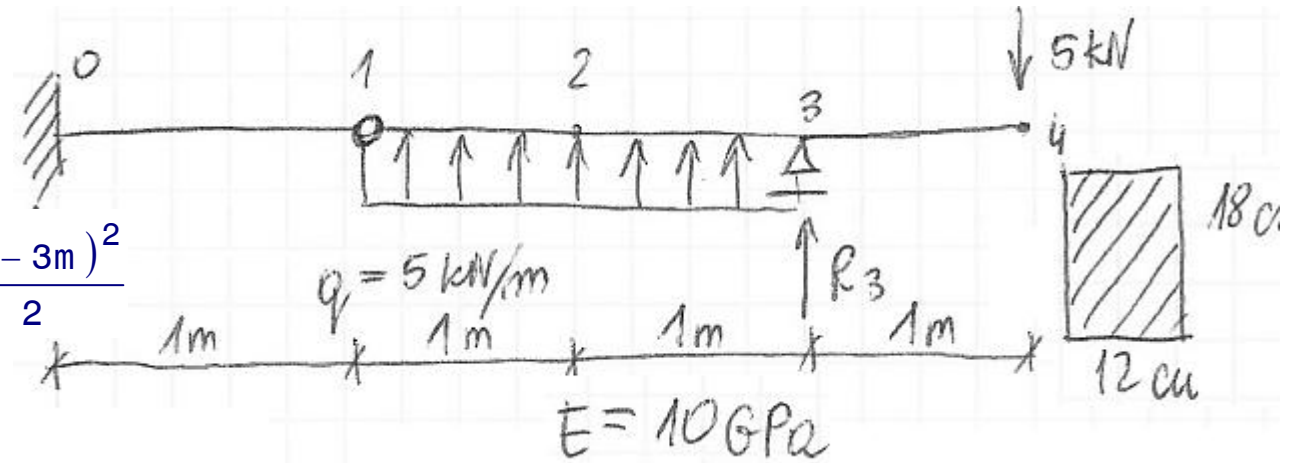
$$i := 3..n \quad M_i := M3(X_i)$$

$$M = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 7.5 \\ 1 & 0 \\ 2 & -5 \\ 3 & -5 \\ 4 & 0 \\ \hline \end{array}$$

· kN · m

$$X = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0 \\ 1 & 1 \\ 2 & 2 \\ 3 & 3 \\ 4 & 4 \\ \hline \end{array}$$

m



x

$$A := \begin{pmatrix} 0 & 2 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & -2 & 1 & 0 \\ 0 & 0 & 1 & -2 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$y := \text{lsolve}(A, \alpha \cdot M)$$

$$y = \begin{pmatrix} 0 \\ 6.43 \\ 7.502 \\ 0 \\ -16.075 \end{pmatrix} \cdot \text{mm}$$

