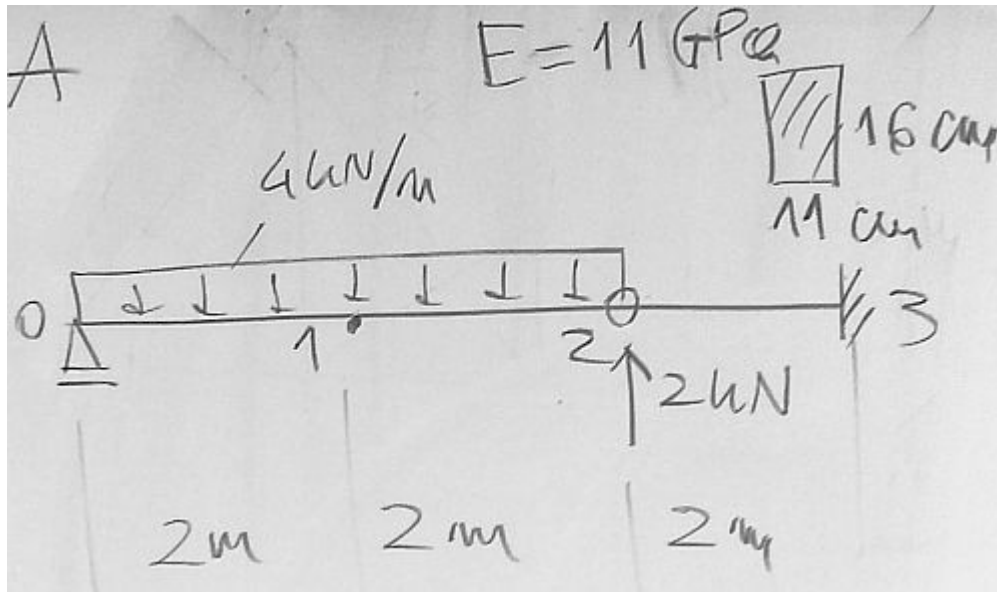


## Metoda różnic skończonych - ugięcie belki



$$P := 2 \text{ kN} \quad q := 4 \frac{\text{kN}}{\text{m}} \quad E := 11 \text{ GPa}$$

$$L := 6 \text{ m} \quad b := 11 \text{ cm} \quad h := 16 \text{ cm} \quad J := b \cdot \frac{h^3}{12} = 3.755 \times 10^3 \cdot \text{cm}^4$$

$$R1 := \frac{q \cdot 4 \text{ m} \cdot 2}{4} = 8 \cdot \text{kN}$$

$$n := 3 \quad \Delta := \frac{L}{n} = 2 \text{ m} \quad \alpha := \frac{\Delta^2}{E \cdot J} \quad \alpha = 9.685 \cdot \frac{1}{\text{MN}}$$

$$M1(x) := R1 \cdot x - q \cdot \frac{x^2}{2} \quad M2(x) := M1(x) + P \cdot (x - 4 \text{ m}) + q \cdot \frac{(x - 4 \text{ m})^2}{2}$$

$$i := 0..n \quad X_i := i \cdot \Delta$$

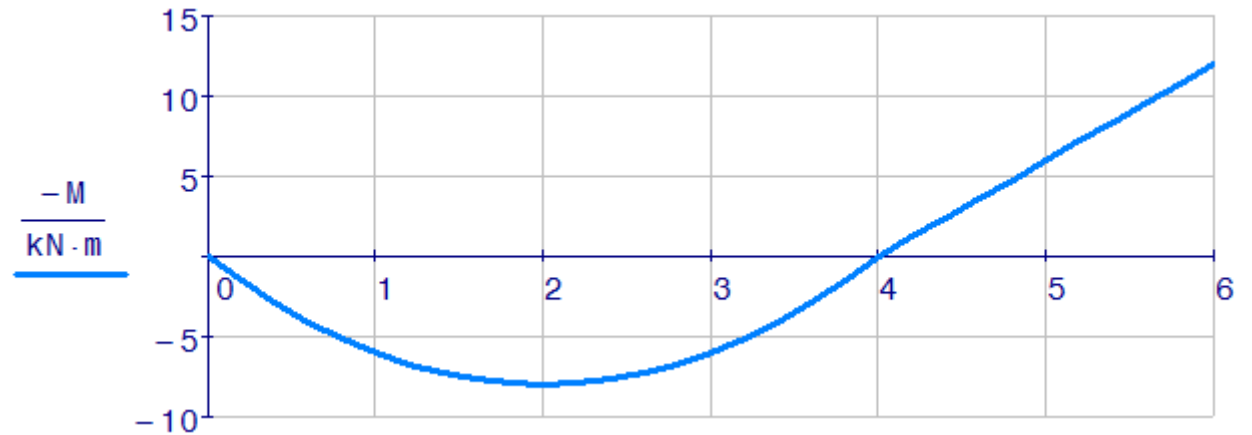
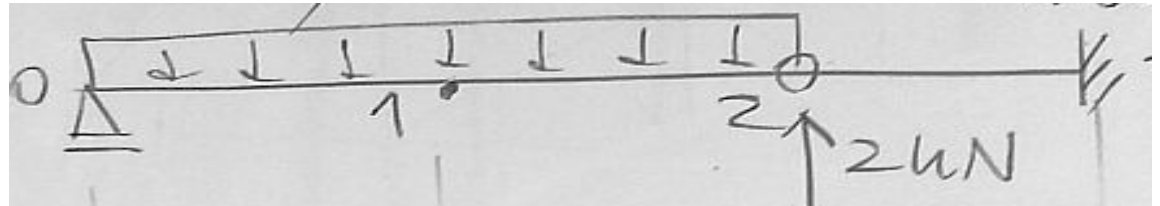
$$i := 0..2 \quad M_i := M1(X_i)$$

$$i := 2..n \quad M_i := M2(X_i)$$

$$M = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0 \\ 1 & 8 \\ 2 & 0 \\ 3 & -12 \\ \hline \end{array} \cdot \text{kN} \cdot \text{m} \quad X = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0 \\ 1 & 2 \\ 2 & 4 \\ 3 & 6 \\ \hline \end{array} \text{m}$$

*Równania MRS*

$$M = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0 \\ 1 & 8 \\ 2 & 0 \\ 3 & -12 \\ \hline \end{array} \cdot \text{kN} \cdot \text{m} \quad y = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0.00 \\ 1 & -67.79 \\ 2 & -58.11 \\ 3 & 0.00 \\ \hline \end{array} \cdot \text{mm}$$



$$y_0 = 0 \quad y_3 = 0 \quad \varphi_3 = 0 \quad \alpha = 9.68492 \cdot \frac{1}{\text{MN}}$$

$$y_0 - 2y_1 + y_2 = \alpha M_1$$

$$2y_2 = \alpha M_3$$