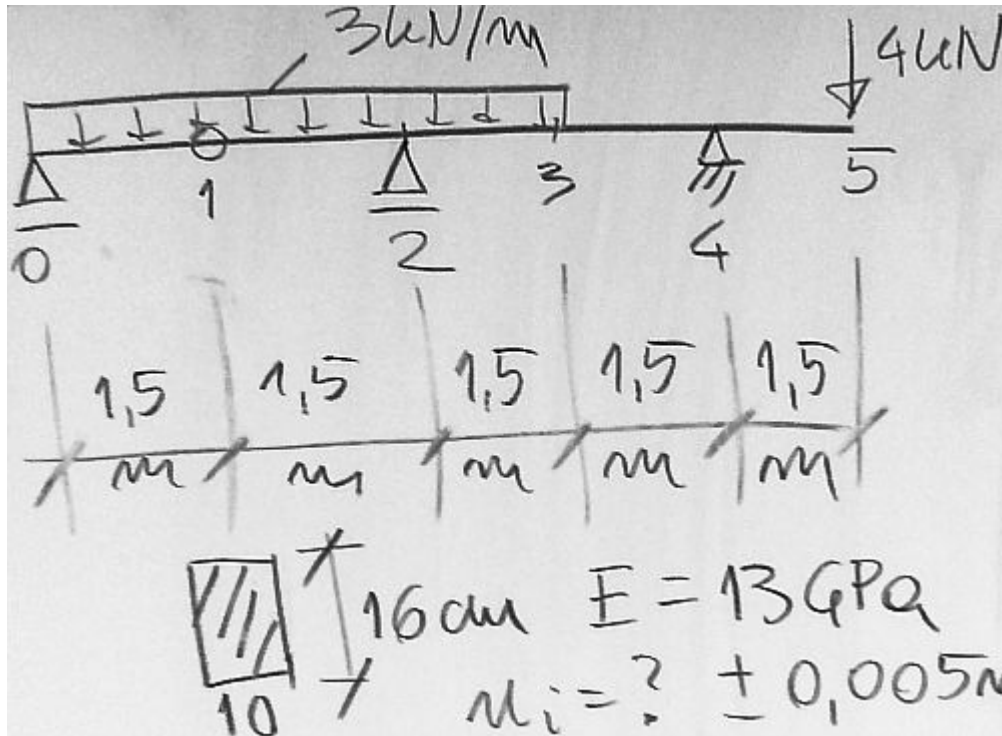


Metoda różnic skończonych - ugięcie belki



$$P := 4 \text{ kN} \quad q := 3 \frac{\text{kN}}{\text{m}} \quad E := 13 \text{ GPa}$$

$$b := 10 \text{ cm} \quad h := 16 \text{ cm}$$

$$L := 7.5 \text{ m} \quad J := b \cdot \frac{h^3}{12} = 3413.3333 \cdot \text{cm}^4$$

$$n := 5 \quad \Delta := \frac{L}{n} = 1.5 \text{ m}$$

$$\alpha := \frac{\Delta^2}{E \cdot J} = 5.07061 \cdot \frac{1}{\text{MN}}$$

dokładność $\pm 0.005 \text{ mm}$

$$R_0 := q \cdot \frac{1.5 \text{ m}}{2} = 2.25 \cdot \text{kN}$$

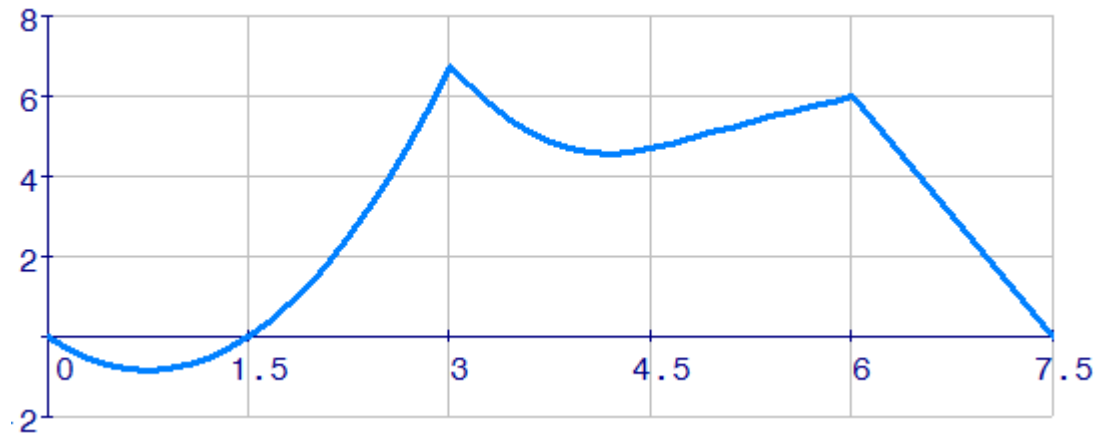
$$R_2 := \frac{q \cdot 4.5 \text{ m} \cdot (2.5 \cdot 1.5 \text{ m}) - R_0 \cdot 6 \text{ m} - P \cdot 1.5 \text{ m}}{3 \text{ m}} = 10.375 \cdot \text{kN}$$

$$M_1(x) := R_0 \cdot x - q \cdot \frac{(x)^2}{2}$$

$$M_2(x) := M_1(x) + R_2 \cdot (x - 3 \text{ m}) \quad M_3(x) := M_2(x) + q \cdot \frac{(x - 4.5 \text{ m})^2}{2}$$

$$M_4(x) := -P \cdot (L - x)$$

$$M = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0.0000 \\ \hline 1 & 0.0000 \\ \hline 2 & -6.7500 \\ \hline 3 & -4.6875 \\ \hline 4 & -6.0000 \\ \hline 5 & 0.0000 \\ \hline \end{array} \cdot \text{kN} \cdot \text{m} \quad X = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0 \\ \hline 1 & 1.5 \\ \hline 2 & 3 \\ \hline 3 & 4.5 \\ \hline 4 & 6 \\ \hline 5 & 7.5 \\ \hline \end{array} \text{ m}$$



Warunki brzegowe

$$y_0 = 0 \quad y_2 = 0 \quad y_4 = 0$$

$$\alpha = 5.07061 \cdot \frac{1}{\text{MN}}$$

Równania MRS

$$y_1 - 2y_2 + y_3 = \alpha M_2$$

$$y_2 - 2y_3 + y_4 = \alpha M_3$$

$$y_3 - 2y_4 + y_5 = \alpha M_4$$

$$y = \begin{array}{|c|c|} \hline & 0 \\ \hline 0 & 0.00 \\ \hline 1 & -46.11 \\ \hline 2 & 0.00 \\ \hline 3 & 11.88 \\ \hline 4 & 0.00 \\ \hline 5 & -42.31 \\ \hline \end{array} \cdot \text{mm}$$