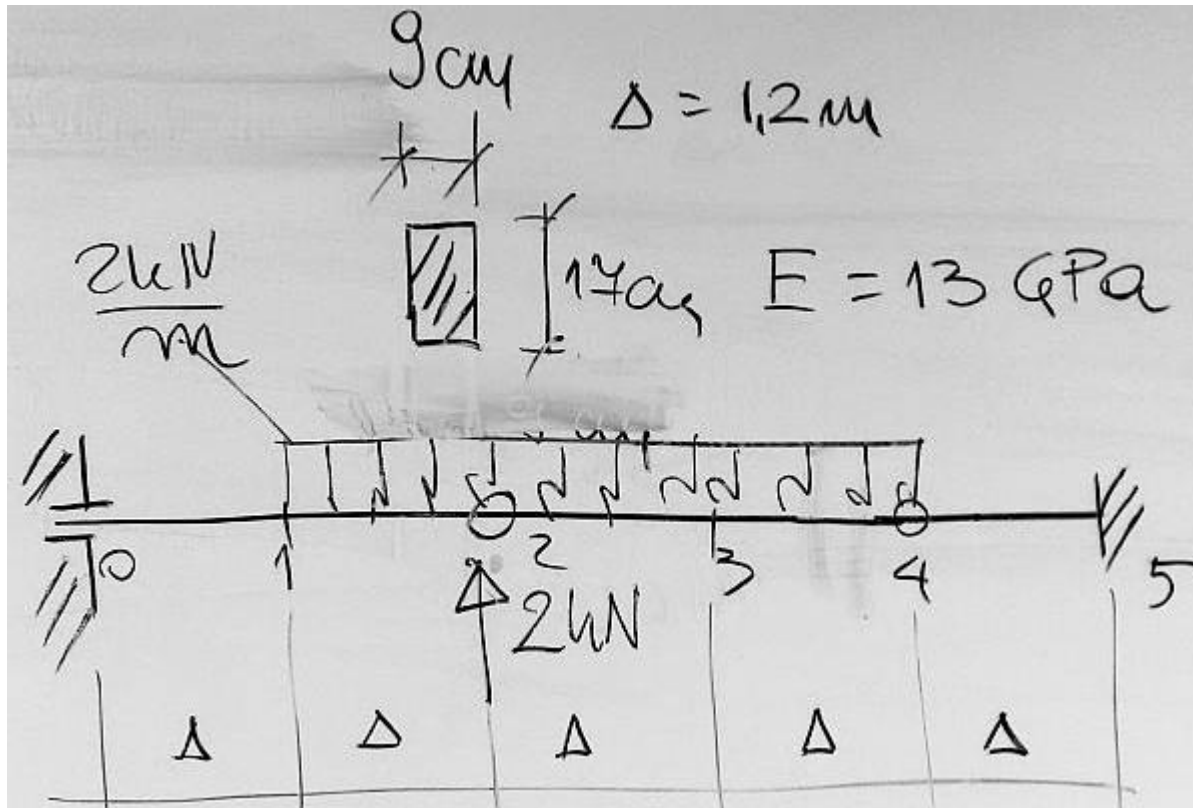


## Metoda różnic skończonych - ugięcie belki



$$P := 2 \text{ kN} \quad q := 2 \frac{\text{kN}}{\text{m}} \quad E := 13 \text{ GPa}$$

$$b := 9 \text{ cm} \quad h := 17 \text{ cm} \quad L := 5 \cdot 1.2 \text{ m}$$

$$n := 5 \quad \Delta := \frac{L}{n} = 1.2 \text{ m}$$

$$J := b \cdot \frac{h^3}{12} = 3684.75 \cdot \text{cm}^4$$

$$\alpha := \frac{\Delta^2}{E \cdot J} = 3.00615 \cdot \frac{1}{\text{MN}}$$

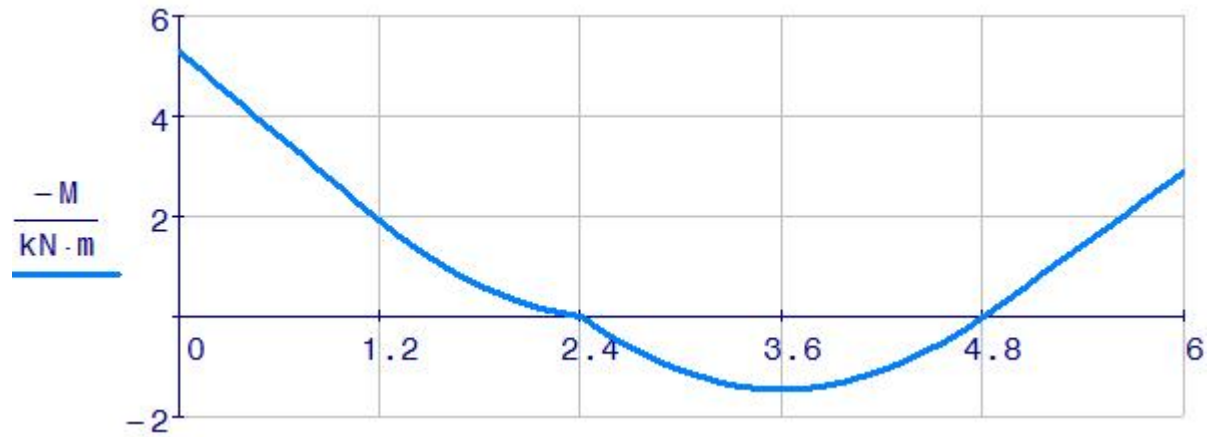
dokładność  $y \pm 0.005 \text{ mm}$

$$R_0 := q \cdot 2\Delta - P = 2.8 \cdot \text{kN} \quad M_0 := (q \cdot \Delta - P) \cdot 2 \cdot \Delta + q \cdot \Delta^2 \cdot 1.5 = 5.28 \text{ kN} \cdot \text{m}$$

$$M_1(x) := -M_0 + R_0 \cdot x \quad M_2(x) := M_1(x) - q \cdot \frac{(x - \Delta)^2}{2} \quad M_3(x) := M_2(x) + P \cdot (x - 2\Delta)$$

$$M_4(x) := M_3(x) + q \cdot \frac{(x - 4\Delta)^2}{2}$$

$\frac{M}{\text{kN} \cdot \text{m}} =$		0	$\frac{x}{\text{m}} =$		0
	0	-5.28		0	0
	1	-1.92		1	1.2
	2	0		2	2.4
	3	1.44		3	3.6
	4	0		4	4.8
	5	-2.88		5	6



### Warunki brzegowe

$$y_0 = 0 \quad \varphi_0 = 0 \quad \text{-----} > \quad 2 y_1 = \alpha M_0$$

$$y_5 = 0 \quad \varphi_5 = 0 \quad \text{-----} > \quad 2 y_4 = \alpha M_5$$

### Równania MRS

$$2 y_1 = \alpha M_0$$

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

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

$$2 y_4 = \alpha M_5$$

$y =$		0	$\cdot \text{mm}$
	0	-0.00	
	1	-7.94	
	2	-21.64	
	3	-15.15	
	4	-4.33	
	5	0.00	

$$\alpha = 3.00615 \cdot \frac{1}{\text{MN}}$$

dokładność  $y \pm 0.005 \text{mm}$