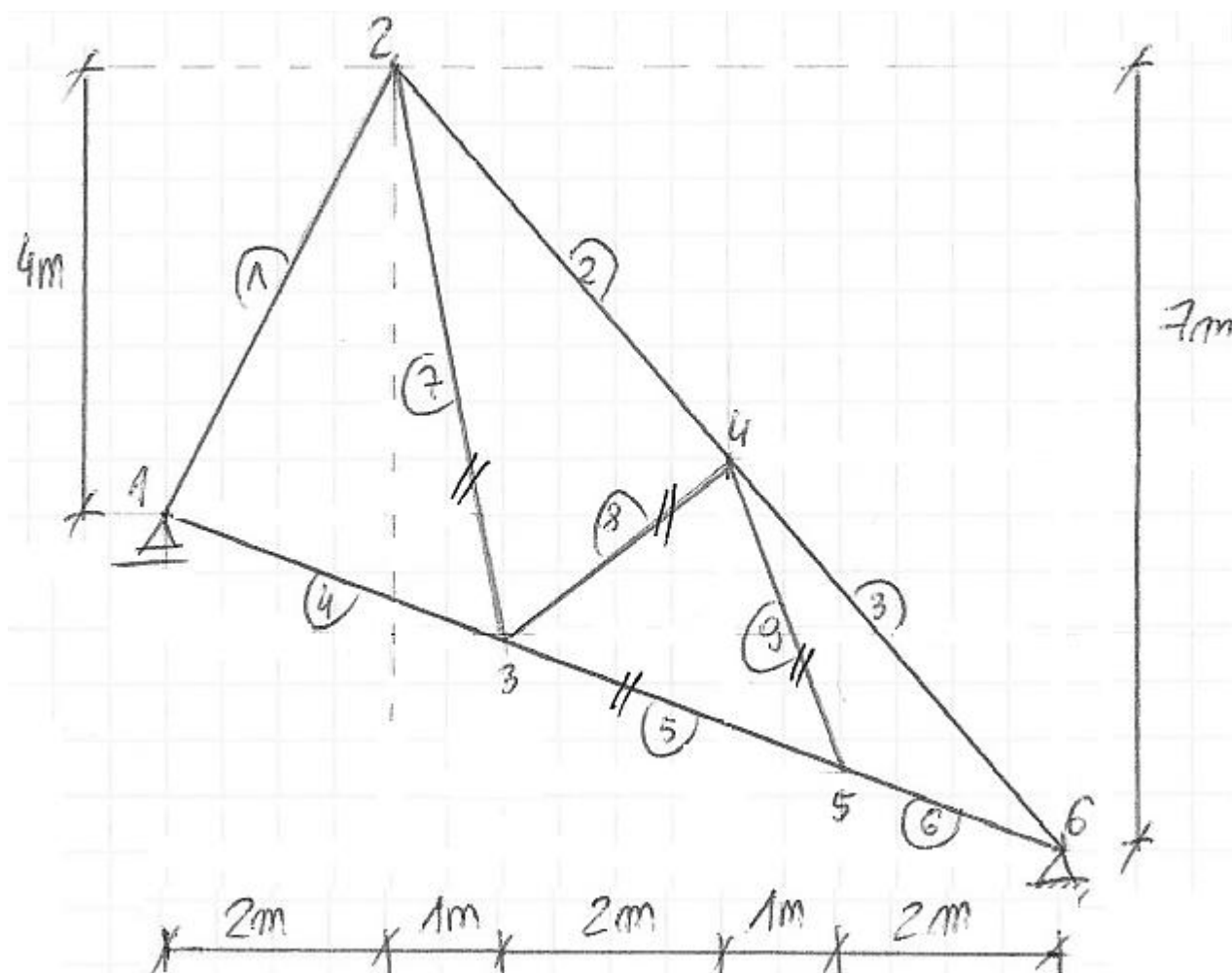


Macierze sztywności elementów kratownicy



elementy := (5, 7, 8, 9)

EA := 25MN

e := 1 .. 9

$$\mathbf{K} = \begin{bmatrix}
 \mathbf{J}^1 + \mathbf{J}^4 & -\mathbf{J}^1 & -\mathbf{J}^4 & & & \\
 -\mathbf{J}^1 & \mathbf{J}^1 + \mathbf{J}^2 + \mathbf{J}^7 & -\mathbf{J}^7 & -\mathbf{J}^2 & & \\
 -\mathbf{J}^4 & -\mathbf{J}^7 & \mathbf{J}^4 + \mathbf{J}^5 + \mathbf{J}^7 + \mathbf{J}^8 & -\mathbf{J}^8 & -\mathbf{J}^5 & \\
 & -\mathbf{J}^2 & -\mathbf{J}^8 & \mathbf{J}^2 + \mathbf{J}^3 + \mathbf{J}^8 + \mathbf{J}^9 & -\mathbf{J}^9 & -\mathbf{J}^3 \\
 & & -\mathbf{J}^5 & -\mathbf{J}^9 & \mathbf{J}^5 + \mathbf{J}^6 + \mathbf{J}^9 & -\mathbf{J}^6 \\
 & & & -\mathbf{J}^3 & -\mathbf{J}^6 & \mathbf{J}^3 + \mathbf{J}^6
 \end{bmatrix} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{matrix}$$

$$X := \begin{pmatrix} 0 \\ 2 \\ 3 \\ 5 \\ 6 \\ 8 \end{pmatrix} \text{ m} \quad Y := \begin{pmatrix} 0 \\ 4 \\ \frac{-3}{8} \cdot 3 \\ 0.5 \\ \frac{-6}{8} \cdot 3 \\ -3 \end{pmatrix} \text{ m} \quad Wp := \begin{pmatrix} 1 \\ 2 \\ 4 \\ 1 \\ 3 \\ 5 \\ 2 \\ 3 \\ 4 \end{pmatrix} \quad Wk := \begin{pmatrix} 2 \\ 4 \\ 6 \\ 3 \\ 5 \\ 6 \\ 3 \\ 4 \\ 5 \end{pmatrix}$$

$$Lx_e := X_{(Wk_e)} - X_{(Wp_e)} \quad Ly_e := Y_{(Wk_e)} - Y_{(Wp_e)} \quad L_e := \sqrt{(Lx_e)^2 + (Ly_e)^2}$$

$$J_e := \frac{EA}{(L_e)^3} \cdot \begin{bmatrix} (Lx_e)^2 & Lx_e \cdot Ly_e \\ Lx_e \cdot Ly_e & (Ly_e)^2 \end{bmatrix}$$

$$\text{Element } e := 5$$

$$Lx_e = 3 \text{ m} \quad Ly_e = -1.125 \text{ m} \quad L_e = 3.204001 \text{ m}$$

$$J_e = \begin{pmatrix} 6840.8 & -2565.3 \\ -2565.3 & 962 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

$$\text{Element } e := 7$$

$$Lx_e = 1 \text{ m} \quad Ly_e = -5.125 \text{ m} \quad L_e = 5.22165 \text{ m}$$

$$J_e = \begin{pmatrix} 175.6 & -899.9 \\ -899.9 & 4612.2 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\text{e} := 8$

$$L_{x_e} = 2 \text{ m}$$

$$L_{y_e} = 1.625 \text{ m}$$

$$L_e = 2.576941 \text{ m}$$

$$J_e = \begin{pmatrix} 5843.7 & 4748 \\ 4748 & 3857.7 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\text{e} := 9$

$$L_{x_e} = 1 \text{ m}$$

$$L_{y_e} = -2.75 \text{ m}$$

$$L_e = 2.926175 \text{ m}$$

$$J_e = \begin{pmatrix} 997.8 & -2743.9 \\ -2743.9 & 7545.8 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$