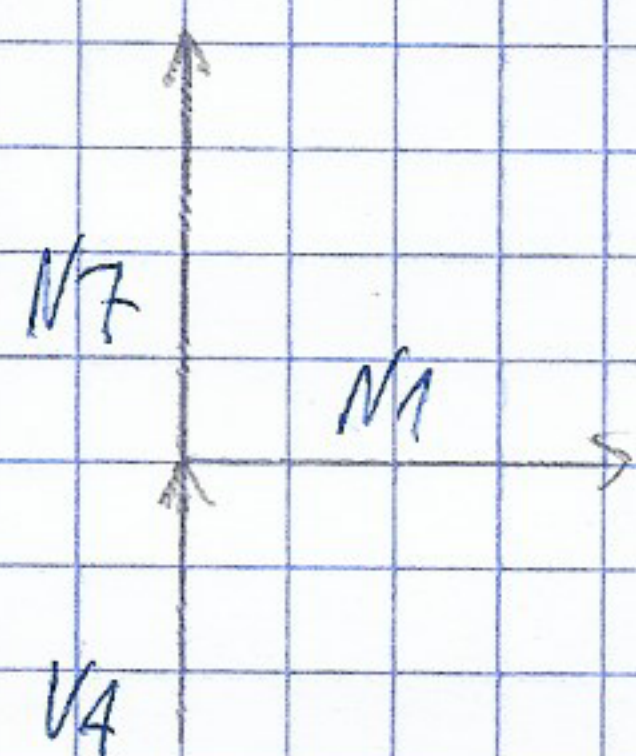


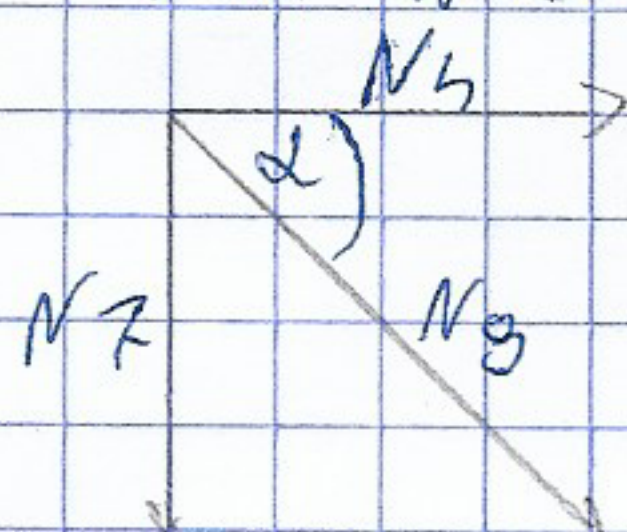
## 5. Obliczenie sił w pręcie kratownicy metodą równoważenia węzłów

### 5.1 Węzeł 1



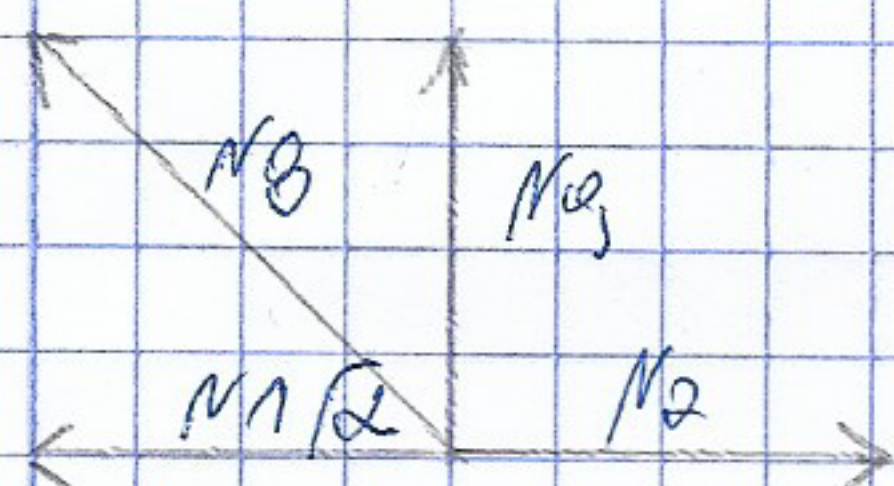
$$\begin{aligned} 4) \quad \sum P_x = N_1 &= 0 \\ 5) \quad \sum P_y = V_4 + N_7 &= 0 \end{aligned} \quad \left. \begin{array}{l} N_1 = 0 \\ N_7 = -V_4 = -29.3763 \text{ kN} \end{array} \right\}$$

### 5.2 Węzeł 5



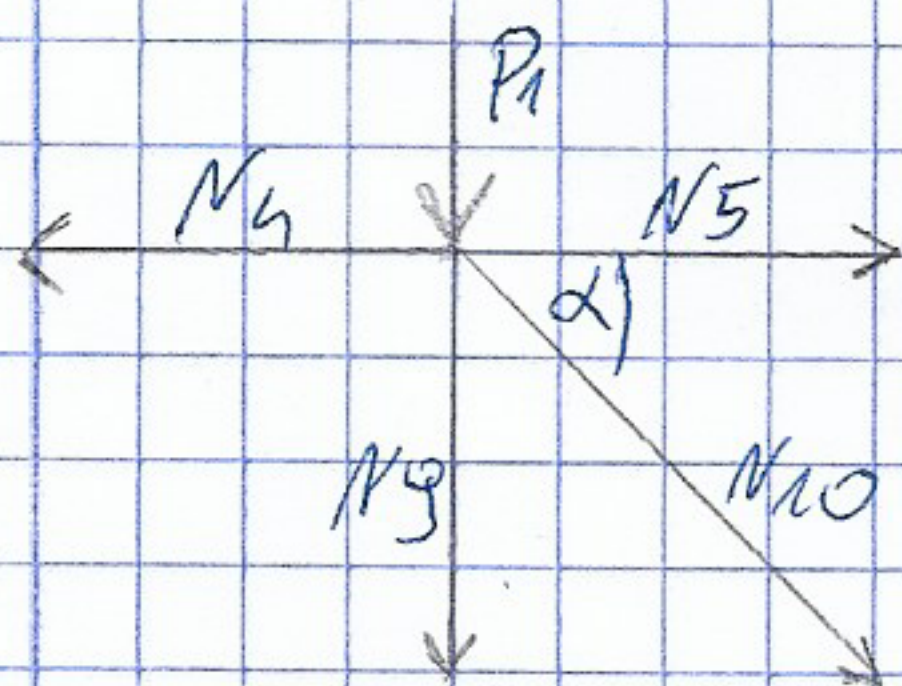
$$\begin{aligned} 6) \quad \sum P_y &= -N_7 - N_8 \cdot \sin \alpha = 0 \\ 7) \quad \sum P_x &= N_4 + N_8 \cdot \cos \alpha = 0 \\ 29.3763 - N_8 \cdot 0.6568 &= 0 \quad \left. \begin{array}{l} N_8 = 44.73 \text{ kN} \\ N_4 + 44.73 \cdot 0.7541 = 0 \end{array} \right\} \\ N_4 + 44.73 \cdot 0.7541 &= 0 \quad \left. \begin{array}{l} N_4 = -33.73 \text{ kN} \end{array} \right\} \end{aligned}$$

### 5.3 Węzeł 2



$$\begin{aligned} 8) \quad \sum P_y &= N_9 + N_8 \cdot \sin \alpha = 0 \\ 9) \quad \sum P_x &= -N_1 + N_2 - N_8 \cdot \cos \alpha = 0 \\ N_9 + 44.73 \cdot 0.6568 &= 0 \quad \left. \begin{array}{l} N_9 = -29.38 \text{ kN} \\ -0 + N_2 - 44.73 \cdot 0.7541 = 0 \end{array} \right\} \\ -0 + N_2 - 44.73 \cdot 0.7541 &= 0 \quad \left. \begin{array}{l} N_2 = 33.73 \text{ kN} \end{array} \right\} \end{aligned}$$

### 5.4 Węzeł 6



$$\begin{aligned} 10) \quad \sum P_y &= -P_1 - N_9 - N_{10} \cdot \sin \alpha = 0 \\ 11) \quad \sum P_x &= -N_4 + N_5 + N_{10} \cdot \cos \alpha = 0 \\ -40 - 29.38 - N_{10} \cdot 0.6568 &= 0 \quad \left. \begin{array}{l} -33.73 + N_5 - 105.63 \cdot 0.7541 = 0 \end{array} \right\} \\ -33.73 + N_5 - 105.63 \cdot 0.7541 &= 0 \quad \left. \begin{array}{l} N_{10} = -105.63 \text{ kN} \\ N_5 = 113.39 \text{ kN} \end{array} \right\} \end{aligned}$$