

Zunächst: $B = \{3, 4, 5\}$, $N = \{1, 2\}$

$$(z_N^*)^T = (-4, -3), \quad x_B^* = \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = B^{-1}, \quad N = \begin{pmatrix} 1 & -1 \\ 2 & -1 \\ 0 & 1 \end{pmatrix}$$

Iteration 1

1. $z_N^* \neq 0 \rightarrow$ also weiter

2. Wähle $j=1$

$$3. \Delta x_B = B^{-1} N e_{j \uparrow} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$$

$$4. \max_{i \in B} \frac{\Delta x_i}{x_i^*} = 1 \Rightarrow t = 1^{-1} = 1$$

5. $i=3$

$$6. \Delta z_N = -(B^{-1} N)^T e_i = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} -1 & +1 \\ -2 & +1 \\ 0 & -1 \end{pmatrix}^T e_{j \uparrow} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad (\text{weil erste Basisvariable})$$

$$= \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

$$7. s = \frac{-4}{-1} = 4$$

$$8. x_1^* = 1, \quad z_N^* = \begin{pmatrix} -4 \\ -3 \end{pmatrix} - 4 \cdot \begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ -7 \end{pmatrix}$$

$$z_3^* = 4, \quad x_B^* = \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} - 1 \cdot \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 5 \end{pmatrix}$$

Check!
Diese 0 muss entstehen!

$$9. B = (B \setminus \{3\}) \cup \{1\} = \{1, 4, 5\}$$

Jetzt: $B = \{1, 4, 5\}, N = \{2, 3\}$

(zum
Gegeprüften) $B = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow B^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

$$N = \begin{pmatrix} -1 & 1 \\ -1 & 0 \\ 1 & 0 \end{pmatrix}$$

$$\Rightarrow x_B^* = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 5 \end{pmatrix}$$

Annotations:
- The top element '1' is circled in red and labeled $= x_1^*$ (check!).
- The middle element '1' is underlined in red and labeled $= x_4^*$ (siehe Punkt 8).
- The bottom element '5' is underlined in red and labeled $= x_5^*$ (siehe Punkt 8).

$$z_N^* = (B^{-1}N)^T c_B - c_N = \begin{pmatrix} -1 & 1 \\ 1 & -2 \\ 1 & 0 \end{pmatrix}^T \begin{pmatrix} 4 \\ 0 \\ 0 \end{pmatrix} - \begin{pmatrix} 3 \\ 0 \end{pmatrix}$$
$$= \begin{pmatrix} -7 \\ 4 \end{pmatrix}$$

Annotations:
- The bottom element '4' is underlined in red and labeled \rightarrow check! $z_3^* = 4$.
- Below it, it says "siehe Punkt 8!".

$$z = c_B^T B^{-1} b$$

$$= (4, 0, 0) \cdot \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} = (4, 0, 0) \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} = 4$$