

max  $C^T x$   
 $Ax = b$   
 $x \geq 0$

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$$\begin{pmatrix} 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \\ x_9 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \quad x \geq 0$$

max  $-y_1 - y_2 - y_3$

$$\begin{aligned} x_1 + x_4 + x_5 - x_7 + y_1 &= 1 \\ x_2 + x_1 + x_3 + y_2 &= 1 \\ x_2 + x_5 + x_6 + x_8 &= 1 \\ x_1 + x_4 + x_6 + y_3 &= 1 \end{aligned}$$

$y_1, y_2, y_3 \geq 0$

$B_1 = \{8, 9, 10, 11\}$

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$$

$C^T - C_B^T A_B^{-1} A$   $k=9$   $-C_B^T A_B^{-1} b$

$i=2 \rightarrow$

$$\begin{array}{cccccccc|c} 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$k=10$

$$\begin{array}{cccccccc|c} 0 & 1 & 2 & 0 & -1 & 1 & 1 & 0 & -2 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$i=3 \rightarrow$

$$\begin{array}{cccccccc|c} 0 & 1 & 1 & -1 & -1 & 0 & 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$k=2$   $j=3$

$$\begin{array}{cccccccc|c} 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & -1 & -1 & 0 & 1 \\ 0 & 0 & -1 & 1 & 2 & 1 & -1 & 1 & 1 & -1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & -1 & -1 & 0 & 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$i=3 \rightarrow$

$$\begin{array}{cccccccc|c} 0 & 1 & 1 & -1 & -1 & 0 & 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$j=4$   $k=11$

$$\begin{array}{cccccccc|c} 0 & -1 & 0 & 2 & 1 & 1 & -1 & 0 & 0 & -2 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & -1 & -1 & 0 & 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & -1 & 0 & 2 & 1 & 1 & -1 & 0 & 1 & -1 & 1 & 1 \end{array}$$

$C^T - C_B^T A_B^{-1} A$   $C_B^T A_B^{-1} b$

$C^T - C_B^T A_B^{-1} A \rightarrow$   $(00000)$   $k=8$

$i=1 \rightarrow$

$$\begin{array}{cccccccc|c} 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 1 & 1 & 1 & -1 & 0 & 1 & -1 & 1 & 1 \end{array}$$

zulässige Startbasis  
 $B = \{1, 3, 4, 8\}$

$$\begin{array}{cccccccc|c} 0 & 0 & 0 & 0 & 0 & -1 & 0 & -1 & -1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$

$B = \{1, 2, 3, 4\} \in$  optimale Basis

$x^* = \begin{pmatrix} 1 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$  ist optimale Lsg!

in Basen Simplex-Methoden und die Zweiphasen-Methoden

max  $4x_1 + x_2 + x_3$   
 max  $2x_1 + x_2 + 2x_3 = 4$   
 $3x_1 + 3x_2 + x_3 = 3$   
 $x_1, x_2, x_3 \geq 0$

max  $-4y_1 - y_2 - M \cdot y_3 - M \cdot y_4$   
 $2x_1 + x_2 + 2x_3 + y_1 = 4$   
 $3x_1 + 3x_2 + x_3 + y_2 = 3$

$j=1$   $x_1, x_2, x_3, y_1, y_2 \geq 0$   $B = \{1, 5\}$   $-C_B^T A_B^{-1} b$

$i=2 \rightarrow$

$$\begin{array}{cccc|c} 2 & 1 & 2 & 1 & 0 & 4 \\ 3 & 3 & 1 & 0 & 1 & 3 \end{array}$$

$i=2 \rightarrow$

$$\begin{array}{cccc|c} 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 \end{array}$$