

$$\begin{cases}
 x_1 + x_2 \rightarrow \max \\
 7x_1 + 4x_2 \leq 28 \\
 5x_1 + 6x_2 \leq 30 + t \\
 x_1 - x_2 \leq 3 + t \\
 x_i \geq 0
 \end{cases}$$

Hinweis Mit der DSM

im Intervall  $[-3, 30]$

Lösen für  $t=0$

|       |    |    | $x_1$ | $x_2$ |   |       |    | $u_3$ | $x_2$ |
|-------|----|----|-------|-------|---|-------|----|-------|-------|
|       | 0  | 0  | -1    | -1    |   | 3     | 1  | 1     | -2    |
| $u_1$ | 28 | 0  | 7     | 4     | ← | $u_1$ | 7  | -7    | -7    |
| $u_2$ | 30 | -1 | 5     | 6     |   | $u_2$ | 15 | -6    | -5    |
| $u_3$ | 3  | 1  | ①     | -1    |   | $x_1$ | 3  | 1     | 1     |

|       |                 |                 | $u_3$           | $u_1$          |   |                 |                 | $u_2$           | $u_1$           |
|-------|-----------------|-----------------|-----------------|----------------|---|-----------------|-----------------|-----------------|-----------------|
|       | $\frac{47}{11}$ | $-\frac{3}{11}$ | $-\frac{3}{11}$ | $\frac{2}{11}$ |   | $\frac{59}{11}$ | $-\frac{3}{22}$ | $\frac{3}{22}$  | $\frac{1}{22}$  |
| $x_2$ | $\frac{7}{11}$  | $-\frac{3}{11}$ | $-\frac{7}{11}$ | $\frac{1}{11}$ | ← | $x_2$           | $\frac{35}{11}$ | $-\frac{7}{22}$ | $\frac{7}{22}$  |
| $u_2$ | 8               | 1               | ②               | -1             |   | $u_3$           | 4               | $\frac{1}{2}$   | $\frac{1}{2}$   |
| $x_1$ | $\frac{40}{11}$ | $\frac{4}{11}$  | $\frac{4}{11}$  | $\frac{1}{11}$ |   | $x_1$           | $\frac{24}{11}$ | $\frac{2}{11}$  | $-\frac{4}{22}$ |

$$\hookrightarrow ZF = \frac{59}{11} - \frac{3}{22} t$$

$$DP = \left( \begin{array}{c} \frac{24}{11} + \frac{2}{11} t \\ \frac{35}{11} - \frac{7}{22} t \end{array} \right)$$

$$t \leq \min \left\{ + \frac{35}{11}, \frac{22}{7} \right\} = 10$$

$$t \geq \max \left\{ - \frac{24}{11}, \frac{11}{2} \right\} = -4.2$$

$$\min \{ -12, -8 \} = -8$$

$$\text{d.h. } t \in [-8, 10]$$

ist etwas größer als 10  $\hookrightarrow$  DSM  $\begin{matrix} x_2 \rightarrow NBV \\ u_1 \rightarrow BV \end{matrix}$

|       |     | $u_2$          | $x_2$           |
|-------|-----|----------------|-----------------|
|       | 6   | $-\frac{1}{5}$ | $\frac{1}{5}$   |
| $u_1$ | -14 | $\frac{7}{5}$  | $-\frac{22}{5}$ |
| $u_3$ | -3  | $\frac{6}{5}$  | $\frac{11}{5}$  |
| $x_1$ | 6   | $-\frac{1}{5}$ | $\frac{6}{5}$   |

$$\frac{24}{11} + \frac{35}{11} \cdot \frac{7}{14} \cdot \frac{22}{5} = \frac{24 + 42}{11} = \frac{66}{11}$$

$$\frac{2}{11} - \frac{7}{22} \cdot \frac{3}{14} \cdot \frac{22}{5} = \frac{20 - 42}{22 \cdot 5} = -\frac{22}{22 \cdot 5} = -\frac{1}{5}$$

$$t \leq \min \{ + 6 \cdot 5 \} = 30$$

$$t \geq \max \left\{ + \frac{3 \cdot 5}{62}, + \frac{14 \cdot 5}{7} \right\} = \max \left\{ \frac{5}{2}, 10 \right\} = 10$$

$$\hookrightarrow BP = \begin{pmatrix} 6 - \frac{1}{5}t \\ 0 \end{pmatrix} \quad zF = 6 - \frac{1}{5}t$$

$$\hookrightarrow t \in [10, 30]$$

für  $t > 30$  - keine Lsg

$$(D) \quad BP \begin{pmatrix} u_1 \\ u_2 \\ u_3 \end{pmatrix} = \begin{pmatrix} \frac{1}{22} \\ \frac{3}{22} \\ 0 \end{pmatrix}$$

$$BP = \begin{pmatrix} 0 \\ \frac{1}{5} \\ 0 \end{pmatrix}$$

$$BP = \begin{pmatrix} \frac{24}{11} + \frac{2}{11}t \\ \frac{35}{11} - \frac{7}{22}t \end{pmatrix}$$

-3 10 30

(P)

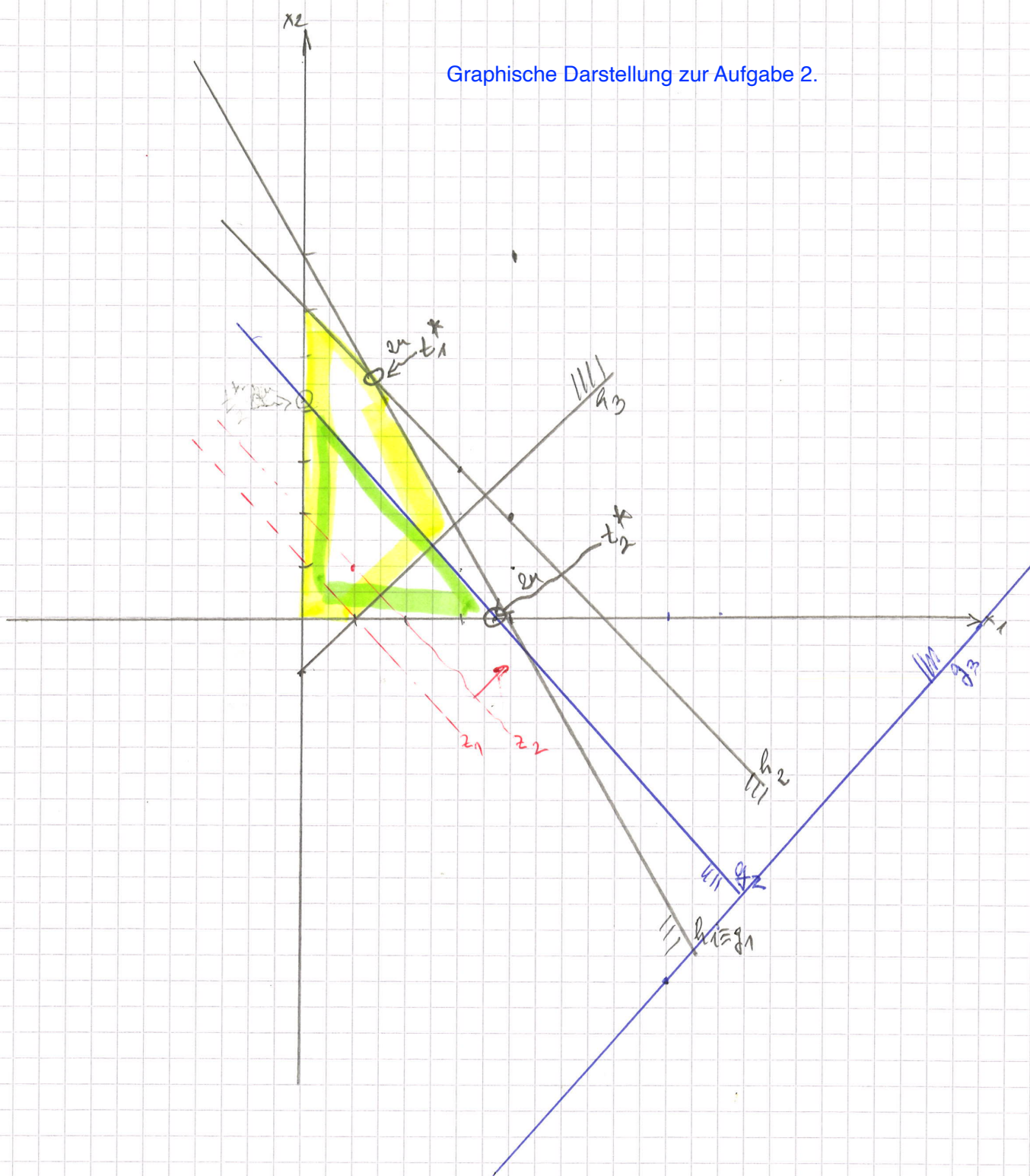
$$BP = \begin{pmatrix} \frac{24}{11} + \frac{2}{11}t \\ \frac{35}{11} - \frac{7}{22}t \end{pmatrix}$$

$$zF = \frac{59}{11} - \frac{3}{22}t$$

$$BP = \begin{pmatrix} 6 - \frac{1}{5}t \\ 0 \end{pmatrix}$$

$$zF = 6 - \frac{1}{5}t$$

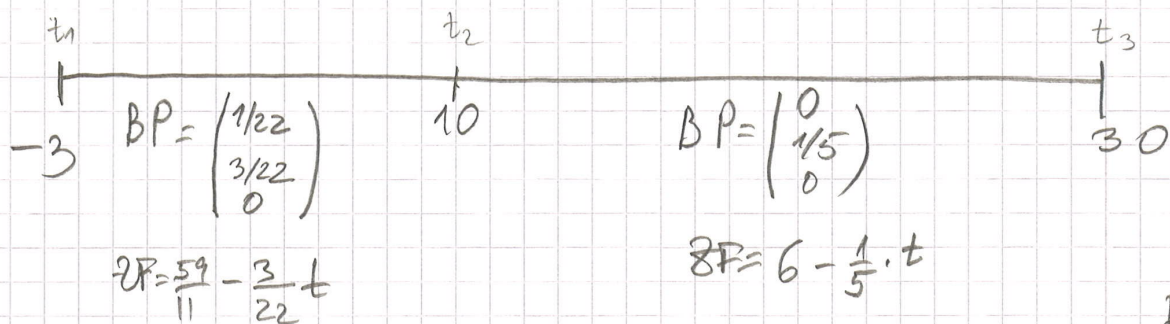
Graphische Darstellung zur Aufgabe 2.





Aufg. 3

$$28y_1 + (30-t)y_2 + (3+t)y_3 \rightarrow \min$$
$$\begin{cases} 7y_1 + 5y_2 + y_3 \geq 1 \\ 4y_1 + 6y_2 - y_3 \geq 1 \\ y_i \geq 0 \end{cases}$$



Aufg. 2:

$$t_1^* = \lceil t_1 \rceil + 1 = \lceil -3 \rceil + 1 = \underline{\underline{-2}}$$

$$t_2^* = \lceil t_2 \rceil + 1 = \underline{\underline{11}}$$

zu  $t_1^* = -2 \Rightarrow$

$$\begin{aligned} b_1: 7x_1 + 4x_2 &\leq 28 & (4, 0), (0, 7) \\ b_2: 5x_1 + 6x_2 &\leq 32 & (4, 2), (3, 2\frac{5}{6}) \\ b_3: x_1 - x_2 &\leq 1 & (0, -1), (1, 0) \end{aligned}$$

$$zF = x_1 + x_2 \rightarrow \begin{aligned} z_1 = x_1 + x_2 &= 1 & (1, 0), (0, 1) \\ z_2 = x_1 + x_2 &= 2 & (2, 0), (0, 2) \end{aligned}$$

zu  $t_2^* = 11 \Rightarrow$

$$\begin{aligned} g_1: 7x_1 + 4x_2 &\leq 28 & (4, 0), (0, 7) \\ g_2: 5x_1 + 6x_2 &\leq 19 & (0, 3\frac{1}{6}), (3\frac{1}{5}, 0) \\ g_3: x_1 - x_2 &\leq 14 & (7, -7), (8, -6) \end{aligned}$$