1) LP: $\max \sum_{i=1}^{n} a_i x_i + b$

NB: $h(x) \le d$

- $h(x) = d$
- $g(x) = d$
- $k(x) \ge d$

2)

f - konvex $\Rightarrow$ teil des Raums oben von dem FG. ist Konvexe Menge.

A ist konvex $\Leftrightarrow \forall x,y \in A \quad \forall \alpha \in (0;1) \quad z = \alpha x + (1-\alpha) y$ ist in A

$A_1, \dots A_m$ - konvexe Mengen

$NB_1 \quad NB_m$

$A_i \cap A_j$ - konvex

$x,y \in A_i \cap A_j \rightarrow x,y \in A_i \quad \forall \alpha_i \in (0,1) \quad \alpha x + (1-\alpha) y \in A_i$

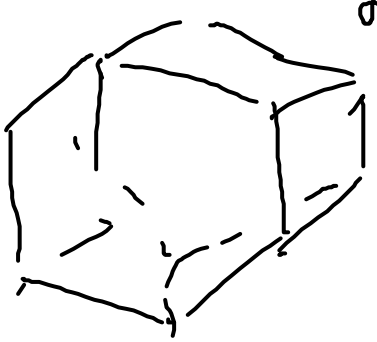
$\in A_j$

$x,y \in A_j$

$\alpha x + (1-\alpha) y \in A_i \cap A_j$

$A_1 \cap A_2 \cap \dots \cap A_n$ ist konvex

konvex



2) a)

$\max \; 0 - 3x_2 + 2x_4$

$x_1 = 1 + x_3 - x_4$

$x_2 = -2 - x_3 + 2x_4$

$x_i \geq 0$

$\max \; 0 - 3x_2 + 2x_4$

$x_1 = 1 + 2x_4 - 2 - x_2 - x_4 = -1 - x_2 + x_4$

$x_3 = -2 - x_2 + 2x_4$

$\max \; -x_0$

$x_1 = -1 - x_2 + x_4 + x_0$

$x_3 = -2 - x_2 + 2x_4 + x_0$

$\max \; -2 - x_2 - x_3 + 2x_4$

$x_0 = 2 + x_2 + x_3 - 2x_4$

$x_1 = 1 + x_3 - x_4$

$\max \; -2 - x_2 - x_3 + 2x_4$

$x_0 = 2 + x_2 + x_3 - 2x_4$

$x_1 = -1 - x_2 + x_4 + 2 + x_2 + x_3 - 2x_4$

$\max \; -2 - x_2 - x_3 + 2 - 2x_1 + 2x_3 = 0 - 2x_1 - x_2 + x_3$

$x_0 = 2 + x_2 + x_3 - 2 + 2x_1 + 2x_3 = 0 + 2x_1 + x_2 + x_3$

$x_4 = 1 - x_1 + x_3$

$\max \; 0 - 2x_1 - x_2 + x_3$

$x_0 = 0 + 2x_1 + x_2 - x_3$

$x_4 = 1 - x_1 + x_3$

$\max \; 0 - 2x_1 - x_2 + 2x_1 + x_2 - x_0 = 0 - x_0$

$x_3 = 0 + 2x_1 + x_2 - x_0$

$x_4 = 1 - x_1 + 2x_1 + x_2 - x_0 = 1 + x_1 + x_2 - x_0$

b)

$$\min\ 2x_1 - 5x_2 - 3x_3$$

$$-x_1 - x_2 + x_3 \leq 4$$

$$5x_1 - x_2 - x_3 \leq 25$$

$$-x_1 + 2x_2 - x_3 \leq 12$$

$$x_i \geq 0$$

$$\max\ -2x_1 + 5x_2 + 3x_3$$

$$-x_1 - x_2 + x_3 + x_4 = 4$$

$$5x_1 - x_2 - x_3 + x_5 = 25$$

$$-x_1 + 2x_2 - x_3 + x_6 = 12$$

$$\max\ -2x_1 + 5x_2 + 3x_3$$

$$x_4 = 4 + x_1 + x_2 - x_3$$

$$x_5 = 25 - 5x_1 + x_2 + x_3$$

$$x_6 = 12 + x_1 - 2x_2 + x_3$$

$$\max\ -2x_1 + 30 + \tfrac{5}{2}x_1 + \tfrac{5}{2}x_3 - \tfrac{5}{2}x_6 + 3x_3$$

$$x_4 = 4 + x_1 + 6 + \tfrac{1}{2}x_1 + \tfrac{1}{2}x_3 - \tfrac{1}{2}x_6 - x_3$$

$$\rightarrow\ x_5 = 25 - 5x_1 + 6 + \tfrac{1}{2}x_1 + \tfrac{1}{2}x_3 - \tfrac{1}{2}x_6 + x_3$$

$$x_2 = 6 + \tfrac{1}{2}x_1 + \tfrac{1}{2}x_3 - \tfrac{1}{2}x_6$$

$$\max\ 30 + \tfrac{1}{2}x_1 + \tfrac{11}{2}x_3 - \tfrac{5}{2}x_6$$

$$\rightarrow\ x_4 = 10 + \tfrac{3}{2}x_1 - \tfrac{1}{2}x_3 - \tfrac{1}{2}x_6$$

$$\rightarrow\ x_5 = 31 - \tfrac{9}{2}x_1 + \tfrac{3}{2}x_3 - \tfrac{1}{2}x_6$$

$$x_2 = 6 + \tfrac{1}{2}x_1 + \tfrac{1}{2}x_3 - \tfrac{1}{2}x_6$$

$$\max\ 30 + \tfrac{1}{2}x_1 + 110 + \tfrac{33}{2}x_1 - \tfrac{22}{2}x_4 - \tfrac{11}{2}x_6 - \tfrac{5}{2}x_6$$

$$x_3 = 20 + 3x_1 - 2x_4 - x_6$$

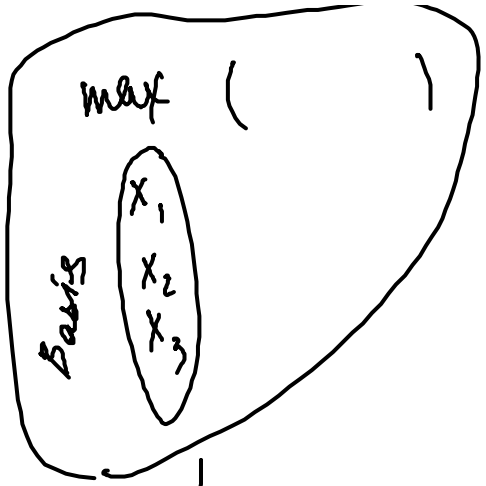
$$x_5 = 31 - \tfrac{9}{2}x_1 + 30 + \tfrac{9}{2}x_1 - 3x_4 - \tfrac{3}{2}x_6 - \tfrac{1}{2}x_6$$

$$x_2 = 6 + \tfrac{1}{2}x_1 + 10 + \tfrac{1}{2}x_1 - x_4 - \tfrac{1}{2}x_6 - \tfrac{1}{2}x_6$$

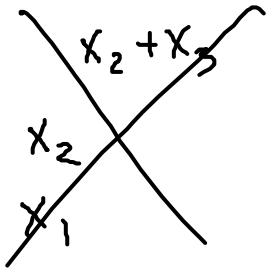
$$\max\ 130 + 17x_1 - 11x_4 - 8x_6$$

- $x_3 = 20 + 3x_1 - 2x_4 - x_6$
- $x_5 = 61 - 3x_4 - 2x_6$
- $x_2 = 16 + x_1 - x_6 - x_4$

unbeschränkt



← No basis Vars



0,3127895

$-x_0$

$d_1x_1 + d_2x_2 + \dots$

$-\beta_1 x'$

$\beta_2 x'$

$-\beta_3 x'$

max positive Koeffizient d'

$\frac{d'}{\beta_i}$, $\beta_i < 0$

$\min \sum_{i=1}^{n} d_i x_i$ → Stand. → Dict. → Sim

$f_1(x) \leq b_1$ → $f_1(x) + x_1^f = b_1$

$\vdots$ $\quad\quad$ $\vdots$

$f_m(x) \leq b_m$ → $f_m(x) + x_m^f = b_1$

$g_1(x) = c_1$

$\vdots$

$g_n(x) = c_n$

$h_1(x) \geq d_1$ → $-h_1(x) + x_1^h = -d_1$

$\vdots$ $\quad\quad$ $\vdots$

$h_K(x) \geq d_K$ → $-h_K(x) + x_K^h = -d_K$

$x_i \geq 0$