① $f(x+y) = f(x) + f(y)$

② $f(\alpha x) = \alpha f(x)$

$f(x) = c^T x = \sum c_i x_i$

$\max_{v, x_{ij}} v$

kostnadsfkt. $f(v) = v$

$f(v_1 + v_2) = f(v_1) + f(v_2)$

$v_1 + v_2 = v_1 + v_2$ linear

$f(\alpha v) = \alpha v$

(P) $\max_{\hat{x}} f(\hat{x})$ bei $g(\hat{x}) = 0$

$h(\hat{x}) \leq 0$

(P) heißt linear $:\Leftrightarrow$ f, g, h linear

$\hat{x} = (v, (x_{ij})_{(i,j)\in E})$

$\sum x_i^2$

$$\begin{pmatrix} v \\ x_{12} \\ x_{23} \\ \vdots \end{pmatrix} = \hat{x}$$

$\min_{x \in \mathbb{R}^n} c^T x$ bei $Ax = b$

$x \geq 0$

$$l_{ij} \leq x_{ij} \leq c_{ij}$$

$$\hat{I}\hat{x} = \begin{pmatrix} v \\ 0 \\ \vdots \\ -v \end{pmatrix} \Bigg| \begin{pmatrix} I & e_t - e_s \end{pmatrix} \begin{pmatrix} \hat{x} \\ v \end{pmatrix} = 0$$

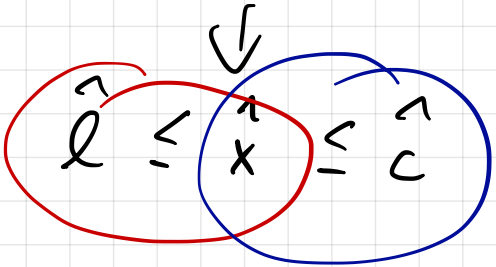
$$v = \begin{pmatrix} 0 \\ \vdots \\ 1 \\ 0 \\ \vdots \\ v \\ 0 \\ \vdots \\ -v \\ 0 \\ \vdots \end{pmatrix} \begin{matrix} \\ \\ \\ s \\ \\ \\ t \\ \\ \\ \\ \end{matrix}$$

$$\hat{A} \begin{pmatrix} \hat{x} \\ v \end{pmatrix} = b$$

$$I\hat{x} = (e_s - e_t)v$$

$$I\hat{x} - (e_s - e_t)v = 0$$

$l_{ij} \le x_{ij} \le c_{ij}$



$A\hat{x} = b$

$\hat{x} \ge 0$

$\hat{x} \le \hat{c} \longrightarrow \hat{x} + s = \hat{c}$

Slackvariable s, $s \ge 0$

$\hat{l} \le \hat{x}$

$w \ge 0$

$\hat{l} + w = \hat{x} \iff \hat{x} - w = \hat{l}$