FMI, CS, Master I
Winter Term 2014/2015
Techniques of Combinatorial Optimization
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Seminar 2

(S2.1) Let $C_n = \{x \in \mathbb{R}^n \mid 0 \leq x_i \leq 1 \text{ for all } i = 1, \ldots, n\}$ be the unit cube in $\mathbb{R}^n$ and F be the intersection of C_n with the hyperplane $\{x \in \mathbb{R}^n \mid x_n = 1\}$. What are the dimensions of C_n and F?

(S2.2) List all faces of the square $P = \{x \in \mathbb{R}^2 \mid 0 \leq x_i \leq 1 \text{ for } i = 1, 2\}$.

Let $A \in \mathbb{R}^{m \times n}, b \in \mathbb{R}^m$ and $P = \{x \in \mathbb{R}^n \mid Ax \leq b\}$ be a nonempty polyhedron.

(S2.3) The following are equivalent for every $y \in \mathbb{R}^n, y \neq \mathbf{0}$:

(i) $y \in \text{lin.space}(P)$.

(ii) For every $x \in P$, the line $L_{x,y} \subseteq P$.

(iii) There exists $x \in P$ such that $L_{x,y} \subseteq P$.

(S2.4) Let F be a face of a polyhedron P. Then F is again a polyhedron. Furthermore, a subset $F' \subseteq F$ is a face of P if and only if it is face of F.