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Convex Optimization

Winter Term 2015/16

— Exercise Sheet 11 —

Exercise 11.1. Let $P \subseteq \mathbb{R}^n$ be an n-dimensional polytope and let $A \in \mathbb{R}^{n \times n}$ be an invertible matrix. Show:

$$\mathcal{E}_{out}(AP) = A\mathcal{E}_{out}(P).$$

Exercise 11.2. Let $T \subseteq \mathbb{R}^3$ be a regular tetrahedron with inradius 1. Show that $\mathcal{E}_{in}(T) = B_3$ and that

$$B_3 \subseteq T \subseteq 3B_3.$$

holds.

Exercise 11.3. Let P be an n-dimensional centrally symmetric polytope, i.e. $P = -P$ holds. Show: If $\mathcal{E}_{in}(P) = B_n$ holds, then

$$B_n \subseteq P \subseteq \sqrt{n}B_n.$$

Exercise 11.4. Determine the Lovász theta number of the 4x4 Rook's graph. This is a graph with 16 vertices where each vertex is adjacent to 6 other vertices. It is defined as follows: The vertices form a grid of size 4×4 and two vertices are adjacent if and only if they either lie in the same row or in the same column.

Hand-in: Until Tuesday, 19th January, 2pm at the "Convex optimization" mailbox in room 3.01 (Studierendenarbeitsraum) of the Mathematical Institute. Please add your name, student number, and group number to your solution sheet.