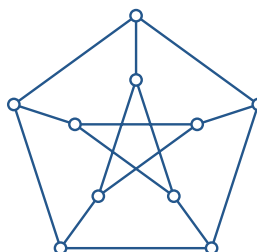Universität zu Köln
Mathematisches Institut
Prof. Dr. F. Vallentin
M. Dostert, M. Sc.
J. Rolfes, M. Sc.

Convex Optimization

Winter Term 2015/16

— Exercise Sheet 8 —

Exercise 8.1. Run the randomized rounding part of the Goemans-Williamson algorithm for the Petersen graph (as depicted on the right) 100 times and compute the average value of the computed cuts.

Exercise 8.2. Let $A \in \mathbb{R}^{m \times n}$ be a matrix. Write the optimization problem $\mathrm{sdp}_{\infty \to 1}(A)$ as semidefinite program in primal standard form.

Exercise 8.3. Let $A \in \mathbb{R}^{m \times n}$ be a rectangular matrix. Show:

$$\|A\|_{\infty \to 1} = \max \left\{ \sum_{i=1}^{m} \sum_{j=1}^{n} A_{ij} x_i y_j : x_i, y_j \in [-1,1], \, i \in [m], j \in [n] \right\}.$$

Exercise 8.4. Show: If $A \in \mathcal{S}_{\succeq 0}^n$, then

$$\|A\|_{\infty \to 1} = \max \left\{ \sum_{i=1}^{n} \sum_{j=1}^{n} A_{ij} x_i x_j : x_i \in \{-1,1\}, \, i \in [n] \right\}.$$

Hand-in: Until Tuesday, 15th December, 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.