Universität zu Köln
Mathematisches Institut
Prof. Dr. F. Vallentin
G. Fischer
Dr. M.C. Zimmermann

# Convex Optimization

Winter Term 2020/21

**— Exercise Sheet 6 (December 15, 2020) —**

**Exercise 6.1.** Implement the ellipsoid method in SageMath. Apply your implementation to solve the following semidefinite optimization probem

$$\sup\{\langle J, X\rangle : X \in \mathcal{S}^n_+,\ \langle I, X\rangle = 1,\ \langle E_{ij}, X\rangle = 0 \text{ (see below)}\}$$

where $J$ is the all ones matrix, $I$ is the identity matrix and where $(i, j)$ runs through

(a)
$$\{(1,2),(1,5),(2,3),(3,4),(4,5)\} \quad \text{and} \quad n = 5,$$

(b)
$$\{(1,2),(1,3),(1,4),(1,5),(1,6),(2,8),(2,11),(3,7),(3,9),(4,8),(4,10),(5,9),(5,11),(6,7),\\ (6,10),(7,8),(7,11),(8,9),(9,10),(10,11)\} \quad \text{and} \quad n = 11.$$