Saarland
Informatics Campus

Assignment 18, Approximation Algorithms
Summer term 2017

Tobias Mömke, Hang Zhou
http://www-cc.cs.uni-saarland.de/course/61/

Due: 25 July 2017

Exercise 18.1 (10 Points) Transform the randomized 2-approximation algorithm from Lecture 13 into a deterministic one and show its approximation ratio.

Exercise 18.2 (10 Points) Let A, B be symmetric $n \times n$ matrices. Prove or disprove: $A \cdot B$ is also a symmetric matrix.

Exercise 18.3 (15 Points) (Exercise 6.1 from Williamson Shmoys)
As with linear programs, semidefinite programs have duals. The dual of the Max Cut SDP is:

$$\text{minimize} \quad \sum_{i<j} w_{ij}/2 + \sum_i \gamma_i/4 \tag{1}$$

$$\text{s.t.} \quad W + \text{diag}(\gamma) \succeq 0 \tag{2}$$

where the matrix W is the symmetric matrix of edge weights w_{ij} and $\text{diag}(\gamma)$ is the matrix of zeroes with γ_i as the ith entry on the diagonal. Show that the value of every feasible solution for this dual is an upper bound on the cost of every cut.