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## Advanced Algorithms

WS 2017/18

### Homework 10

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#### Exercise 1:

Show that the dual linear program of a primal linear program in canonical form is a linear program in canonical form as well.

#### Exercise 2:

A system of linear inequalities  $Ax \leq b$  is called *inconsistent* if there is a  $y$  with  $y^T A = 0$ ,  $y^T b < 0$  and  $y \geq 0$ . Show that the system  $Ax \leq b$  has no solution iff the system is inconsistent.

#### Exercise 3:

Consider the criterion in Theorem 3.5 of the lecture. Is this criterion necessary? Prove its necessity or give a counterexample.

#### Exercise 4:

Let be given a primal-dual pair of linear programs. Prove the following assertion: If the primal linear program has a degenerate optimal solution then the dual linear program has more than one optimal solutions.