
Efficient Algorithms and Datastructures II

Aufgabe 1 (10 Punkte)

Give an example of a (non-linear) program where strong duality does not hold.

Aufgabe 2 (10 Punkte)

Consider the problem of minimizing the function $x^2 + y^2$ s.t. $x + y = 2$. Find the lagrangian, lagrangian dual for this problem and its solution.

Aufgabe 3 (10 Punkte)

How many points does simplex visit in the Klee-Minty cube in the worst case. For the 3-dimensional example studied in lecture, give the objective function value corresponding to these points.

Aufgabe 4 (10 Punkte)

(a) Convince yourself that the following LP solves the max-flow problem:

$$\begin{array}{ll} \text{maximize} & \sum_{p \in P} x_p \\ \text{subject to} & \sum_{p \ni e} x_p \leq c_e \quad \forall e \in E \\ & x_p \geq 0 \end{array}$$

where c_e denotes the capacity (upper bound) of edge e and P is the set of all paths from the source to the target.

(b) Write the dual of the above linear program.