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Advanced Algorithms

WS 2019/20

Homework 9

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Exercise 1:

Develop an algorithm for the solution of linear programs

$$\begin{aligned}\min z(x) &= c^T x \\ Ax &= b \\ x &\geq 0\end{aligned}$$

with A is an $(m \times n)$ -matrix and $\text{rank}(A) < m$.

Exercise 2:

Consider the following linear program LP:

$$\begin{aligned}\min z(x) &= x_1 + x_3 \\ x_1 + 2x_2 &\leq 5 \\ x_2 + 2x_3 &= 6 \\ 2x_1 - 3x_2 &\geq 3 \\ x_1, x_2, x_3 &\geq 0\end{aligned}$$

- Solve LP using the simplex algorithm.
- Determine the dual linear program LP' of LP.
- Present the complementary slackness condition and use this condition to get a solution of LP'. Evaluate the optimal costs of LP and LP' to examine your solution.

Exercise 3:

Replace in LP the inequality by $x_1 + 2x_2 \leq -5$ and repeat Exercise 2 for the resulting linear program.