SF1811 HOME ASSIGNMENT 1
A COMPUTER PROGRAM FOR THE SIMPLEX METHOD

1. Purpose

The purpose of this assignment is to learn the simplex method by writing your own `Matlab` (or `Python`) code. Your code will also be used in home assignment 2.

2. Code

Consider for $x \in \mathbb{R}^n$ a linear programming problem in canonical form

$$\begin{aligned} &\max c^T x \\ &\text{subject to } Ax \leq b \text{ and } x \geq 0\,, \end{aligned} \tag{2.1}$$

for given vectors $c \in \mathbb{R}^n$ and $b \in \mathbb{R}^m$, and $m \times n$ matrix A. Write your own code that implements in `Matlab` or `Python` all steps of the simplex method in the standard form corresponding to (2.1), using slack variables. You may assume that $b \geq 0$ so that an initial basic feasible solution is based on the slack variables. Check that your code gives the same answer as the command `linprog`. Write short comments in your code to explain it.

3. Instructions for the report

The aim of the homework assignment is to practice using mathematical concepts and `Matlab` and to write a good report. This means that a solution with only formulas is not acceptable. The solution should be similar to the presentation of examples in the course literature. The purpose of the report is to well explain the problem, theoretical background and results for a master student who has taken the course SF1811 but not done this home assignment. Write using your own words. In the grading, the teacher considers how well the report:

- explains the problem and the background
- presents the results.

For instance, the teacher takes into account

- is the report correct,
- is the report well written,
- are the figures and derivations well chosen,
- will the reader of the report learn something.

The report does not have to be long, probably shorter than 5 pages. Matlab code should be included, e.g in an appendix. The most important is that what is written in the report is correct and that the reader learns something. The form of the report is not important, e.g. it does not matter if the there is table of context or a section "conclusion".