

# Operations Research

## Homework 4

Due on October 5, 2022

**Note:** Your homework must be submitted via moodle (see the link on the class website) on the due day BEFORE THE TUTORIAL, i.e., before 20:45.

### Problem 1 [10 points]

Solve the following Linear Programming problem with the simplex method as shown in class (i.e., step by step on paper). (Of course, write the problem in standard form first.)

*Maximize*

$$Z = x_1 + 2x_2$$

*subject to*

$$x_1 + 3x_2 \leq 8,$$

$$x_1 + x_2 \leq 4,$$

$$x_1, x_2 \geq 0.$$

### Problem 2 [3 points]

Reconsider Problem 1 from Homework Sheet 1, i.e., *minimize*

$$Z = 8x_1 + 12x_2$$

*subject to*

$$5x_1 + 2x_2 \geq 20,$$

$$4x_1 + 3x_2 \geq 24,$$

$$x_2 \geq 2,$$

$$x_1, x_2 \geq 0.$$

Recall that on Homework Sheet 2 Problem 3, you wrote this problem in standard form. If you do this, you will find an obvious basic solution with  $x_1 = 0$  and  $x_2 = 0$ . Can you take this as a starting basic solution for the simplex method? (Hint: Is this a *feasible* basic solution?) If not, what would be the obvious brute-force way to get the simplex method started anyway?

### Problem 3 [7 points]

Write a concrete Pyomo model to solve Problem 1 above. You should submit your Ipython notebook or python source code (or pdf printout) which shows the model setup and the computed solution.