

Tutorials
Optimisation
2018
Exercise Sheet 5

Exercise 8:

Consider the following linear program:

$$\begin{array}{rcl}
 \min & -\frac{3}{4}x_1 + 20x_2 - \frac{1}{2}x_3 + 6x_4 & - 3 \\
 \text{s.t.} & \frac{1}{4}x_1 - 8x_2 - x_3 + 9x_4 & \leq 0 \\
 & \frac{1}{2}x_1 - 12x_2 - \frac{1}{2}x_3 + 3x_4 & \leq 0 \\
 & & x_3 \leq 1 \\
 & & x_1, x_2, x_3, x_4 \geq 0
 \end{array}$$

Use the Simplex method (following the Bland's rule) in order to find the optimal objective function. Hint: This is the example from the lectures which is cycling.

- (a) You should first figure out from which iteration on things will be different.
- (b) Do only the final iterations.

Exercise 9:

While solving a standard form problem, we arrive at the following tableau, with x_3 , x_4 , and x_5 being the basic variables:

		x_1	x_2	x_3	x_4	x_5
	-10	δ	-2	0	0	0
$x_3 =$	4	-1	η	1	0	0
$x_4 =$	1	α	-4	0	1	0
$x_5 =$	β	γ	3	0	0	1

The entries $\alpha, \beta, \gamma, \delta, \eta$ in the tableau are unknown parameters. For each of the following statements, find some parameter values that will make the statement true:

- (a) The current solution is infeasible.
- (b) The current solution is feasible but not optimal.
- (c) The optimal cost is $-\infty$.
- (d) The current solution is optimal and there are multiple optimal solutions.

Exercise 10:

Consider the following linear program:

$$\begin{array}{rcll} \min & 4x_1 & + & 4x_2 & + & x_3 & & \\ s.t. & x_1 & + & x_2 & + & x_3 & = & 2 \\ & 2x_1 & + & x_2 & & & = & 3 \\ & 3x_1 & + & 2x_2 & + & x_3 & = & 5 \\ & & & & & x_1, x_2, x_3 & \geq & 0 \end{array}$$

Solve this LP with the Simplex Method using the Big-M method.