ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Bachelor semester 4-DO

DISCRETE OPTIMIZATION WEEK 6

EXERCISE 1

We showed in class that if a linear program in *equational form* is feasible and bounded, then it has an optimal solution which is a vertex of the polyhedron of feasible solutions. Show that this is not always true for general linear programs. Namely, construct a linear program that is feasible and bounded but whose set of optimal solutions does not contain any vertex.

EXERCISE 2

Consider the following simplex tableau. Specify the entering variable and the leaving variable according to the following pivot rules :

a) Largest coefficient
b) Largest increase
c) Steepest edge
d) Bland's rule

$$\begin{array}{rcl} x_1 & = & 4 + 2x_4 - x_5 - 6x_6 \\ x_2 & = & 3 - 3x_4 - 2x_5 - 3x_6 \\ x_3 & = & 2 - x_4 + 5x_5 - 3x_6 \\ \hline z & = & 3 - 5x_4 + x_5 + 2x_6 \end{array}$$

EXERCISE 3

Let P be the following linear program in equational form :

Maximize $-x_1 + 3x_2 - x_3 + 3x_4$

Subject to :

$$\begin{array}{rcl} 3x_1 + 2x_2 - 7x_3 + x_4 & = & -1 \\ 2x_1 + x_2 + x_3 + x_4 & = & 5 \\ x_1 - 3x_2 - 3x_3 & = & 10 \end{array}$$

Which auxiliary linear program do we have to solve in order to find a basic feasible solution for P ?