

Homework 1

Operations Research

February 6, 2007

1

Consider the linear program (P)

$$\begin{aligned} &\text{Maximize } Z = 2x_1 + x_2 - x_3 \\ &\text{subject to} \\ &\quad x_1 + x_3 \leq 3 \\ &\quad 2x_1 + 3x_2 + x_3 \leq 7 \\ &\quad x_1 - x_3 \leq 1 \\ &\quad x_1 \geq 0, x_2 \geq 0 \text{ and } x_3 \geq 0. \end{aligned}$$

Let x_4 , x_5 and x_6 be the slack variables in the three first constraints.

- Formulate the dual of (P).
- Indicate an initial feasible basis for (P).
- Solve (P) by using the simplex method. Show all simplex tableaus and all basic feasible solutions generated. How many pivots are needed? Explain the details of every pivot, and provide an optimal dual basic solution.

2

Consider the linear program (P)

$$\begin{aligned} &\text{Maximize } Z = x_1 - 9x_2 \\ &\text{subject to} \\ &\quad x_1 + 3x_2 + 2x_3 \leq 12 \\ &\quad 2x_1 + 2x_3 = 14 \\ &\quad 5x_1 + 3x_2 + 8x_3 = 50 \\ &\quad x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

- Formulate a phase 1 model for this problem.
- Find an initial feasible basis for (P) by solving the phase 1 model with the simplex method.
- From the basis found in (b), solve the problem (P) with the simplex method.

For every pivot, provide the simplex tableau and the basic solution. Also, provide an optimal dual basic solution.