Universität Erlangen-Nürnberg
Naturwissenschaftliche Fakultät I
Prof. Dr. K. Klamroth 19.05.2003

Linear and Network Optimization
Exercise 7

Please return your solutions by Tuesday, May 27th, 10:00 a.m., in the mailbox No. 5.

Problem 1 (3 points)
Solve the following LP graphically:

$$\begin{array}{llllllllll} \min & 6x_1 & + & \frac{11}{5}x_2 & + & 2x_3 & - & 3x_4 & & \\ \text{s.t.} & 2x_1 & + & x_2 & + & x_3 & - & 3x_4 & \geq & 1 \\ & 3x_1 & & & - & x_3 & - & x_4 & \geq & 1 \\ & & & & & & & x_i & \geq & 0, \quad i = 1, \ldots, 4. \end{array}$$

Problem 2 (10 points)
The Oakwood Furniture Company has 12.5 units of wood on hand for the manufacturing of tables and chairs. Producing one hundred tables requires two units of wood and producing one hundred chairs requires one unit of wood. Oakwood's distributor pays twenty thousand Canadian Dollars for one hundred tables and fifteen thousand Canadian Dollars for one hundred chairs, but he will not accept more than eight hundred chairs and he wants at least twice as many chairs as tables.
How many tables and chairs should the company produce so as to maximize its revenue?

(a) Give a linear programming formulation (P) for this problem and determine its dual (D).

(b) Solve (D) with the dual simplex method.

(c) Determine the primal optimal solution using the complementary slackness conditions.

(d) Check your results from (b) and (c) by solving (P) with the simplex method. (You can use your implementation of the simplex method.)

(e) Suppose someone wants to buy one unit of the 12.5 available units of oak from the company. What is the least amount of money that the company should charge for this one unit of oak?

Problem 3 (7 points)
Solve the LP

$$\begin{array}{llllll} \min & -2x_1 & - & x_2 & & \\ \text{s.t.} & x_1 & + & 4x_2 & \leq & 4 \\ & 4x_1 & + & 3x_2 & \leq & 6 \\ & x_1 & - & x_2 & \leq & 1 \\ & & & x_1, x_2 & \geq & 0 \end{array}$$

with the primal-dual simplex method.