General Mathematics and Computational Science I

Exercise 18

November 17, 2005

1. The last problem on the November 15 exercises has the standard form *minimize* $\zeta = -2\,y_1 - y_2 + y_3 + 5$ *subject to*

$$\begin{aligned} y_1 + y_2 + s_1 &= 4\,, \\ y_2 - y_3 + s_2 &= 0\,, \\ -y_1 - y_3 + s_3 &= 1\,, \\ y_i \geq 0 \text{ and } s_i &\geq 0 \text{ for } i = 1, 2, 3\,. \end{aligned}$$

   Solve this linear programming problem using the simplex method.

2. Solve the following linear programming problem using the simplex method.

   Maximize $z = 3\,x_1 + 4\,x_2$ subject to

$$\begin{aligned} 2\,x_1 + x_2 &\leq 4\,, \\ 3\,x_1 + 2\,x_2 &\leq 8\,, \\ x_i \geq 0 &\text{ for } i = 1, 2\,. \end{aligned}$$

3. (From Lial *et al.*) Southwestern Oil supplies two distributors in the Northwest from two outlets, S_1 and S_2, respectively. Distributor D_1 needs at least 3000 barrels of oil, and distributor D_2 needs at least 5000 barrels. The two outlets can furnish up to 5000 barrels of oil. The costs per barrel to ship the oil are given in the table

	D_1	D_2
S_1	\$30	\$20
S_2	\$25	\$22

   There is also a shipping tax per barrel as given in the table below. Southwestern Oil is determined to spend no more than \$40 000 on shipping tax.

	D_1	D_2
S_1	\$2	\$6
S_2	\$5	\$4

   How should the oil be supplied to minimize shipping costs?