

620-261 Introduction to Operations Research

ASSIGNMENT 2

Post in boxes by 3.00 pm on Monday 31st March 2008

1. Solve the following optimization problems using the “graphical” method outlined in class.

(a)

$$\max 3x_1 + 5x_2$$

such that

$$2x_1 + 3x_2 \leq 12$$

$$3x_1 + 4x_2 \geq 6$$

$$x_1, x_2 \geq 0$$

(b)

$$\max 3x_1 + 2x_2$$

such that

$$4x_1 + 3x_2 \leq 12$$

$$3x_1 + 4x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

(c)

$$\max 3x_1 + 2x_2 + x_3$$

such that

$$3x_1 + x_2 + x_3 = 4$$

$$3x_1 + x_2 \leq 5$$

$$x_1 + 4x_2 \leq 6$$

$$x_1, x_2, x_3 \geq 0$$

2. A whisky blending company has 3,000 litres of type A spirit, 5,000 litres of type B spirit and 10,000 litres of type C spirit available. From these three types of spirit the company can blend three grades of whisky, which are made up in the percentage proportions given below.

whisky grade	type A	type B	type C
grade 1	90	10	0
grade 2	30	50	20
grade 3	10	30	60

The profit per litre for selling grades 1, 2 and 3 is \$12, \$6, \$4 respectively.

- (a) Formulate a linear programming problem whose solution tells the manager of the company how much of each grade of whisky should be made in order to maximise profit.
- (b) Write the resulting linear program in canonical form.
- (c) Write down the maximum number of basic solutions that this problem can have.
- (d) By evaluating the objective function at each basic solution, determine the optimal solution to the problem. (Hint: I would not recommend trying to do this by hand. It is possible, but it would take you a long time. Using Matlab to solve the linear equations is a better way. You can access Matlab in the department's PC lab any time that there is not a class in there.)