620-151
Introduction to Biomedical Mathematics
Semester 1, 2005
Homework Assignment 3

Given out: Wednesday 13th April.
Due: Wednesday 27th April before 5pm.
Put in the assignment box of your tutor.

1. Use the simplex method to solve the following standard maximum problem.

   Maximise \( g = 4y_1 - 2y_2 + 3y_3 \)

   subject to \( y_1 + 2y_2 + y_3 \leq 10 \)
   \( 5y_1 + 2y_2 + 0y_3 \leq 42 \)
   \( 2y_1 - y_2 + 3y_3 \leq 46 \)

   with \( y_1 \geq 0, y_2 \geq 0 \) and \( y_3 \geq 0 \).

   At each step show clearly the row operation(s) that you perform. Inspect your final tableau and state the maximum possible value of \( g \) and all the values of \((y_1, y_2, y_3)\) for which this maximum occurs. For this maximum, state and check the slack in each of the problem constraints.

   (6 marks)

2. Write down the standard minimum problem which is dual to the problem in question 1 above, and write down its solution.

   (3 marks)

3. Use the simplex method to solve the following standard maximum problem.

   Maximise \( g = -10x_1 + 15x_2 + 3x_3 \)

   subject to \( x_1 + 5x_2 + x_3 \leq 10 \)
   \( 3x_1 + x_2 - x_3 \leq 1 \)
   \( -4x_1 + 5x_2 + x_3 \leq 15 \)
   \( 2x_1 - 6x_2 + 3x_3 \leq 18 \)

   with \( x_1 \geq 0, x_2 \geq 0, \) and \( x_3 \geq 0 \).

   At each step show clearly the row operation(s) that you perform. State the maximum possible value of \( g \) and all the values of \((x_1, x_2, x_3)\) for which this maximum occurs. Check your answer!

   (6 marks)