3E1 Problem Sheet 18

April 26 – May 2, 2004

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1. Bring the following linear optimisation problem into normal form and solve it by the simplex method.
   Maximise $f(x_1, x_2) = 20x_1 + 30x_2$ subject to the constraints

$$(1) \quad x_2 \leq 6 \qquad (2) \quad 2x_1 - 3x_2 \leq 0$$

2. Solve the following linear optimisation problem in normal form by the simplex method.
   Maximise $f(x_1, x_2, x_3) = 40x_1 + 60x_2 + 72x_3$ subject to the constraints

$$\begin{array}{ll} (1) & 120x_1 + 80x_2 + 106x_3 + x_4 = 1100 \\ (2) & 30x_1 + 45x_2 + 54x_3 + x_5 = 450 \\ (3) & 5x_1 + 5x_2 + x_3 + x_6 = 50 \\ (4) & 40x_1 + x_7 = 120 \\ & x_i \geq 0 \text{ for } 1 \leq i \leq 7 \end{array}$$

   Solve this problem using the simplex method.

3. Evaluate the integral

$$\int_C \frac{\sin z}{z^2 - 1} \, dz,$$

   where z is a complex variable and

   (a) C is the couterclockwise oriented circle of radius $\frac{1}{2}$ about the origin.

   (b) C is the couterclockwise oriented circle of radius 3 about the origin.