November 30, 2004 Lecturer Dmitri Zaitsev Michaelmas Term 2004

Course 2E1 2004-05 (SF Engineers & MSISS & MEMS)

S h e e t 7

Due: in the tutorial sessions next Wednesday/Thursday

Exercise 1

Use the method of Lagrange multipliers to find the local extreme values (local maxima and local minima) of the function f subject to the constraint:

(i) $f(x, y) = xy$ on the ellipse $x^2 + 4y^2 = 1$;

(ii) $f(x, y) = x^2 y$ on the line $x + y = 3$;

(iii) $f(x, y) = 2x - y + 6$ on the circle $x^2 + y^2 = 4$;

(iv) $f(x, y, z) = xyz$ on the plain $x + y + z = 1$.

(v) $f(x, y, z) = x + 2y + 3z$ on the sphere $x^2 + y^2 + z^2 = 25$.

Exercise 2

Minimize the function f subject to two constraints:

(i) $f(x, y, z) = xyz$ on the intersection of $x^2 + y^2 - 1 = 0$ and $x - z = 0$;

(ii) $f(x, y, z) = x^2 + y^2 + z^2$ on the intersection of $y + 4z - 4 = 0$ and $4y^2 - z^2 = 0$.