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

Sheet 12

Due: in the tutorial sessions next Wednesday/Thursday

Exercise 1

Find the absolute maximum and minimum of the function f on the region R (use the first derivative test to find the critical points in the interior, the method of Lagrange multipliers for the boundary curves, add the corners to the set of points found and compare the values of f to select the maximal and minimal ones):

- (i) $f(x,y) = x^2 + y^2 2x 2y$, R is the triangular bounded by the x- and y-axes and the line x + y = 3;
- (ii) f(x,y) = x y, R is the region above the x-axis and below the parabola $y = 4 x^2$.

Exercise 2

Find $\mathbf{u} - \mathbf{v}$, $5\mathbf{u}$, $\|\mathbf{v}\|$, the dot product $\mathbf{u} \cdot \mathbf{v}$ and determine whether \mathbf{u} and \mathbf{v} are orthogonal (or for which values of parameters, if any are present):

(i) $\mathbf{u} = (1, 2), \, \mathbf{v} = (2, -1);$

- (ii) $\mathbf{u} = (1, 0, 1, 0), \mathbf{v} = (1, 1, 1, 1);$
- (iii) $\mathbf{u} = (k, 0, 0, -k), \mathbf{v} = (k, 2, 1, 2);$
- (iv) $\mathbf{u} = (a, b), \mathbf{v} = (-b, 2a).$