November 16, 2004 Lecturer Dmitri Zaitsev Michaelmas Term 2004

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

S h e e t 5

Due: in the tutorial sessions next Wednesday/Thursday

Exercise 1

Find the gradient of the function:

(i) $f(x, y) = x - y$;

(ii) $f(x, y) = e^{x-y}$;

(ii) $f(x, y, z) = x(\mathsf{cos}y + \mathsf{sin}z)$;

Exercise 2

Find the derivative of the function f at the point P_0 in the direction of the vector $\mathbf{a}$:

(i) $f(x, y) = x - y, \quad P_0(1, 0), \quad \mathbf{a} = (1, 1)$;

(ii) $f(x, y) = x^2 + y^2, \quad P_0(-1, -1), \quad \mathbf{a} = (-1, 2)$;

(iii) $f(x, y, z) = 2e^x \mathsf{cos}(yz), \quad P_0(0, 0, 0), \quad \mathbf{a} = (1, 0, 1)$.

Exercise 3

Find tangent line to the curve given by the equation at the given point P_0:

(i) $x^2 + y^2 = 8, \quad P_0(-2, 2)$;

(ii) $xy = -1, \quad P_0(1, -1)$.

Exercise 4

Find tangent plane to the surface given by the equation at the given point P_0:

(i) $x^2 + y^2 + z^3 = 3, \quad P_0(-1, -1, 1)$;

(ii) $z - 2x^2 = 0, \quad P_0(1, 1, -2)$.

(iii) $\mathsf{cos}\pi x - yz = 0, \quad P_0(0, 1, 1)$.