January 25, 2005 Lecturer Dmitri Zaitsev Hilary Term 2005

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

S h e e t 11

Due: in the tutorial sessions next Wednesday/Thursday

Exercise 1

Write $\iiint_D f(x,y,z)\,dV$ as iterated integral in cylindrical coordinates without evaluating (i.e. write it as iterated integral of a function in r, θ, z and set up the limits):

(i) $f(x,y,z) = 5$, D is the cylinder $x^2 + y^2 < 1$, $-1 \le z \le 1$;

(ii) $f(x,y,z) = x^2+y^2$, D is the circular cylinder whose base is the circle $(x-1)^2+y^2 = 1$ in the xy-plane and whose top lies in the plane $z = 2 + y$.

Exercise 2

Set up the iterated integral with correct limits that calculates the volume of the given solid D in spherical coordinates ρ, φ, θ without evaluating:

(i) D is the solid between the spheres $\rho = 1$ and $\rho = 2$;

(ii) D is the solid bounded by the sphere $\rho = 1$ in the half-space $z \ge 0$;

(iii) D is the solid bounded by the sphere $\rho = 1$ in the half-space $y \ge 0$;

(iv) D is the solid bounded below by the xy-plane, on the sides by the sphere $\rho = 1$, and above by the cone $\varphi = \pi/4$.