SM221S-6021   EXAM THREE
Thursday, March 29, 2007   Name_____

Please answer the following 6 questions in the space provided. Additional paper is available should you need it. Show the details of your work and indicate your answers clearly. I am more interested in the process you use to discover a solution than I am in the solution itself. When you rely on your calculator for a computation, please make it clear what you asked your calculator to do.

The first four problems involve the region T in the xy-plane. T is a triangle with vertices at (0,0), (3,0), and (3,-3).

1. (10 points) Write down equations for the three lines which form the boundary of T.

2. (10) Find the volume of the solid which lies above T and below the paraboloid
    $z = x^2 + y^2$.

3. (25) Find the x-coordinate of the center of mass of a lamina occupying the triangle T, if the density at the point (x,y) is $x^2 + y^2$.

4. (10) Find the area of the portion of the surface $z = x^2 + y^2$ which lies above T. (Your calculator will only give you a decimal approximation.)

5. (25) Consider the iterated integral $\int_{-4}^{4}\int_{0}^{\sqrt{16-x^2}} y\,dy\,dx$.

    (a) Sketch the region of integration.

    (b) Write this integral as an iterated integral in rectangular coordinates with the order of integration reversed.

    (c) Write this integral as an iterated integral in polar coordinates.

6. (20) E is the region bounded below by the surface $z = \sqrt{3x^2 + 3y^2}$ and bounded above by the surface $x^2 + y^2 + z^2 = 16$.
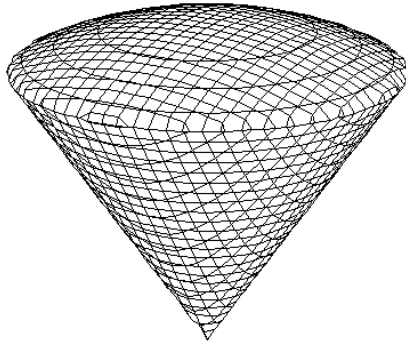
(a) Set up an iterated integral in cylindrical coordinates equal to $\iiint_E y^2 \, dV$.

(b) Set up an iterated integral in spherical coordinates equal to $\iiint_E y^2 \, dV$.