Math 275-001 **Exam 3** Name ______________________

April 16, 2008

This test consists of 100 points and 4 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

(10) 1. Using 2 subdivisions along each axis and the upper left corner of the partition rectangles, what is the Riemann sum approximating

$$\int_1^3 \int_2^3 \sqrt{x^2+y^2}\,dx\,dy$$

2. The double integral $\iint\limits_E \sin(y^3)\,dA$ can be written as

$$\int_0^4 \int_{\sqrt{x}}^2 \sin(y^3)\,dy\,dx$$

(10) (a) Sketch the region E.

(10) (b) Integrating with respect to x first, find the value of the integral.

(15) 3. Evaluate the following integral

$$\int_{-1}^{0}\int_{-\sqrt{1-y^2}}^{0} \cos(x^2+y^2)\,dx\,dy$$

(10) 4. Sketch the region of integration for the following polar coordinates integral.

$$\int_{-\pi/4}^{\pi/3}\int_{0}^{5\sec(\theta)} r^3\sin^2(\theta)\,dr\,d\theta$$

5. You have a lamina bounded by the graphs of $y = 1/x$, $y = x$, $y = 0$ and $x = 2$ and the density of this region is given by $\delta(x, y) = x$

(5) (a) Set up, but do not evaluate, an integral or sum of integrals whose value is the mass of this lamina.

(5) (b) Set up,but do not evaluate, an integral or sum of integrals whose value is the moment about the x-axis.

(5) (c) Set up,but do not evaluate, an integral or sum of integrals whose value is the moment about the y axis.

(5) (d) The value of the mass is $4/3$, the value of the moment about the x axis is $1/8 + \ln(2)/2$ and the value of the moment about the y axis is $7/4$. What are the coordinates of the center of mass for this lamina.

(10) 6. Set up an integral whose value is the surface area of the bounded part of the paraboloid $z = x^2 + y^2$ that is cut off by the plane $z = 4$

7. Let R be the triangle with vertices (1,0), (4,0) and (4,3).

(5) (a) Using the transformation $x = u, \quad y = u - v$, describe the region in the uv-plane that corresponds to R.

(5) (b) What is the Jacobian of the transformation?

(5) (c) Using this change of variables, set up the following integral in the uv- coordinate system.

$$\iint\limits_R (2x - y)\cos(y - 2x)\,dA$$