Math 13. Multivariable Calculus. Written Homework 2.

Due on Monday, 4/9/12.

You can turn in this homework either in class or by leaving it in the boxes in the hallway outside of Kemeny 105 by 12:30 pm on Monday. Please write problems 1-3 on separate pages from problems 4-6 and turn them in separately, since they will be graded by different graders.

1. Use polar coordinates to find the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 16$ and outside the cylinder $x^2 + y^2 = 4$.

2. Let D be the disk with center at the origin and radius a. What is the average distance from points in D to the origin?

3. Consider a square fan blade with sides of length 2 and the lower left corner placed at the origin. If the density of the blade is $\rho(x, y) = 1 + 0.1\,x$, is it more difficult to rotate the blade about the x-axis or the y-axis?

4. Find the mass and center of mass of the lamina that occupies the region bounded by $y = x^2$ and $y = x + 2$, with density function $\rho(x, y) = kx^2$.

5. Evaluate the triple integral $\iiint_T xyz\,dV$, where T is the solid tetrahedron with vertices $(0, 0, 0), (1, 0, 0), (1, 1, 0), (1, 0, 1)$.

6. Sketch the solid whose volume is given by the following iterated integral, and compute the value of that volume:
$$\int_0^2 \int_0^{2-y} \int_0^{4-y^2} dx\,dz\,dy.$$