WRITTEN HOMEWORK #4, DUE 2/03/2012 AT 4PM

You may turn this assignment at the homework boxes on the bottom floor of Kemeny or at the beginning of class on Friday. Please staple your assignment before turning it in. Remember that you need to provide correct and reasonably complete details to receive full credit. The problems are taken from the 7th edition of Stewart's *Calculus*, although occasionally a problem will be modified to be slightly different from its textbook counterpart.

(1) (Problem #28, Chapter 15.7) Sketch the solid whose volume is given by the following iterated integral, and compute the value of that volume:

$$\int_0^2 \int_0^{2-y} \int_0^{4-y^2} dx\, dz\, dy.$$

(2) (Problem #33, Chapter 15.7) (Consult the textbook for a useful figure.) The figure shows the region of integration for the integral

$$\int_0^1 \int_{\sqrt{x}}^1 \int_0^{1-y} f(x, y, z)\, dz\, dy\, dx.$$

Rewrite this integral as an equivalent iterated integral in the five other orders. Give some reasons for why your answers are correct (in particular, give a brief explaination of how you calculate projections of this region to the various coordinate planes).

(3) (Problem #55a, Chapter 15.7) Find the region E for which the triple integral

$$\iiint_E (1 - x^2 - 2y^2 - 3z^2)\, dV$$

is a maximum. Why is your answer correct?

(4) (Problem #24, Chapter 15.8) Find the volume of the solid that lies between the paraboloid $z = x^2 + y^2$ and the sphere $x^2 + y^2 + z^2 = 2$.

(5) (Problem #28, Chapter 15.8) Find the mass of a ball B given by $x^2+y^2+z^2 \leq a^2$ if the density at any point is proportional to its distance from the z-axis. Your density function will have a constant in it; you can either keep the constant in your calculations or just assume the constant is 1. (Think about why this problem is better suited to cylindrical than spherical coordinates; you don't have to answer this in writing, but it is worth understanding why you use cylindrical coordinates here.)

(6) (Problem #28, Chapter 15.9) Find the average distance from a point in a ball of radius a to its center.