Problem Set 1 Calculus 3 Due 10/25/10

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points. For full credit indicate clearly how you reached your answers. All work must be legible and submitted on clean paper without ragged edges.

1. a) Find the center of mass of one leaf of the rose $r = \cos n\theta$, for n a positive integer.

   b) Find the center of mass of the entire rose $r = \cos n\theta$, for n a positive integer.

2. a) Find the center of mass of the portion of a sphere (centered at the origin) of radius R lying in the first octant.

   b) Find the center of mass of the portion of a sphere (centered at the origin) of radius R lying outside the first octant.

3. Find the volume of the region satisfying $z \geq x^2$, $z \geq y^2$, $x \geq y^2$, $y \geq x^2$.

4. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{1+x^2+y^2+z^2}\, dz\,dy\,dx$ [without use of a computer].