Homework 5, Math 308, Spring 2010, due March 15th

(1) Calculate $\int\int(9+2y^2)^{-1}dxdy$ over the quadrilateral with vertices $(1,3),(3,3),(2,6),(6,6)$.

(2) Find the volume in the first octant bounded by the coordinate planes and the plane $x+2y+z=4$.

(3) Calculate the following integral by changing the order of integration (since it can not be done as it stands, easily).

$$\int_{x=0}^{2}\int_{y=x}^{2} e^{-y^2/2}dydx.$$

(4) Let S be a circle with center $(0,4)$ and radius $r<4$ in the xy-plane. Calculate the volume enclosed and the surface area when it is revolved around the x-axis. (This object is called a torus, which is doughnut shaped).

(5) Let $y=f(x)$, $a\leq x\leq b$ be an arc where we assume that $f(x)>0$ for all x in this interval. Write down integrals expressing the area under the arc (that is between the arc and the x-axis), the arc length, the volume of the solid generated when revolved about the x-axis and the surface area of this solid of revolution.

(6) Find the volume inside the cone $3z^2=x^2+y^2$, above the plane $z=2$ and inside the sphere of radius six with center the origin, using spherical coordinates.

(7) Compute the gravitational attraction on a unit mass at the origin due to the mass (of constant density, say ρ) of a body which is bounded by the sphere $r=2a$ and above the $z=a$ plane. (Denote by G, the gravitational constant, so that the force between two point masses m_1,m_2 situated at a distance r is Gm_1m_2/r^2).