MAC 2313, Section 04 with Dr. Hurdal
Fall 2011 – Assignment 3

Due: Thursday November 10, 2011 at the beginning of class.

Please hand in complete solutions to the following problems. Points will be allocated for clear and well written mathematical solutions.

Homework must be stapled to be accepted.

1. Find the volume of the portion of the solid $x^2 + y^2 + z^2 = 16$ that lies between the cones $z = -\sqrt{\dfrac{x^2 + y^2}{3}}$ and $z = \sqrt{\dfrac{x^2 + y^2}{3}}$.

2. Use an appropriate change of variables to find the volume of the solid region lying below the surface $f(x,y) = \sqrt{(x-y)(x+4y)}$ and above the region bounded by the parallelogram with vertices $(0,0)$, $(1,1)$, $(5,0)$, $(4,-1)$. Sketch the region and its image under the transformation.

3. Sketch the vector field $\mathbf{F}(x,y) = \langle y, -2x \rangle$.

Bonus: A circular cylindrical hole is bored through a solid sphere, the axis of the hole being a diameter of the sphere. The volume of the remaining solid is

$$V = 2 \int_0^{2\pi} \int_0^{\sqrt{3}} \int_1^{\sqrt{4-z^2}} r \, dr \, dz \, d\theta.$$

Find the radius of the hole and the radius of the sphere.