MAC 2313, Section 04 with Dr. Hurdal
Spring 2008 – Assignment 4

Due: Monday March 30, 2008 at the beginning of class.

With your group (2-3 people per group), please hand in complete written solutions (1 solution set per group in one hand writing) for the following questions. Points will be allocated for clear and well written mathematical solutions.

Individually, hand in a typed log which you sign, of when your group met and who was there, include when you worked on the problems by yourself, and also rank each member of your group (including yourself) with a percentage contribution to the assignment. Individuals who do not submit a typed log will have points deducted. It is not guaranteed that every group member will get the same grade.

Homework must be stapled to be accepted.

1. Given a sphere of radius R, use integration to show:
a) the volume of the sphere is $\frac{4}{3}\pi R^3$.
b) the surface area of the sphere is $4\pi R^2$.

2. Use the transformation $x = \dfrac{u}{v}$ and $y = v$ to evaluate $\int\int_R xy\,dA$ where R is the region in the first quadrant bounded by the lines $y = x$ and $y = 3x$ and the hyperbolas $xy = 1$ and $xy = 3$. Also, sketch R and the image of R under the transformation.

3. Evaluate $\displaystyle\int_0^4 \int_0^{\sqrt{16-x^2}} \int_0^2 \sqrt{x^2+y^2}\,dz\,dy\,dx$.

4. Sketch the gradient vector field of $f(x, y) = -xy$.

5. Find the work done by the force field $\mathbf{F}(x, y) = x\mathbf{i} + xy\mathbf{j}$ on a particle that moves counterclockwise around the circle $x^2 + y^2 = 9$ from $(0, -3)$ to $(3, 0)$.