# WRITTEN HOMEWORK #8, DUE 3/2/2012 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) (Chapter 16.6, Problem #42) Find the surface area of the part of the cone $z = \sqrt{x^2 + y^2}$ that lies between the plane $y = x$ and the parabolic cylinder $y = x^2$.

(2) (Chapter 16.6, Problem #64c) (You did Problem #64a on the last homework assignment. You may want to consult your answer to that problem here.) Find the surface area of a torus obtained by rotating a circle of radius $a$ in the $xz$-plane with center at $(b, 0, 0)$ about the $z$-axis. (Consult the textbook for a picture.)

(3) (Chapter 16.7, Problem #4) Suppose that $f(x, y, z) = g(\sqrt{x^2 + y^2 + z^2})$, where $g$ is a function of one variable such that $g(2) = -5$. Evaluate $\iint\limits_S f(x, y, z)\, dS$, where $S$ is the sphere $x^2 + y^2 + z^2 = 4$.

(4) (Chapter 16.7, Problem #39) Find the center of mass of the hemisphere $x^2 + y^2 + z^2 = a^2, z \geq 0$, if it has constant density.

(5) (Chapter 16.7, Problem #29) Let $\mathbf{F} = \langle x, 2y, 3z \rangle$, and let $S$ be the cube with vertices $(\pm 1, \pm 1, \pm 1)$ with positive orientation. Evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$.

(6) (Chapter 16.7, Problem #49) Let $\mathbf{F}$ be an inverse square vector field (ie, $\mathbf{F}(\mathbf{r}) = c\mathbf{r}/|\mathbf{r}|^3$ for some constant $c$, where $\mathbf{r} = \langle x, y, z \rangle$). Show that the flux of $\mathbf{F}$ across a sphere $S$ centered at the origin is independent of the radius of $S$.