Math 13: Written Homework # 8
Due May 21 at 5pm

Please make sure your homework is stapled, if necessary before handing it in. Do not use paper clips or any variation of folding techniques to connect papers.

Solutions should be justified in a rigorous way. If you are unsure how much work to show, you can ask me prior to turning in your assignment. 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 16.7, Problem #4) Suppose that $f(x, y, z) = g(\sqrt{x^2 + y^2 + z2})$, 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 $x^2 + y^2 + z^2 = 4$.

(2) (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.

(3) (Chapter 16.7, Problem #29) Let $\boldsymbol{F} =< x, 2y, 3z >$, and let S be the cube with vertices $(\pm 1, \pm 1, \pm 1)$ with positive orientation. Evaluate $\iint\limits_S \boldsymbol{F} \cdot d\boldsymbol{S}$.

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