Math 13, Multivariable Calculus
Written Homework 8

1. (Chapter 16.6, #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, #64a) Find a parametric representation for the torus obtained by rotating about the z-axis the circle in the xz-plane with center $(b, 0, 0)$ and radius $a < b$. (See the textbook for a picture and a relevant hint.)

3. (Chapter 16.6, #64c) Use the parametric representation from the previous problem to find the surface area of the torus.

4. (Chapter 16.7, #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 $\iint_S f(x, y, z)\, dS$, where S is the sphere $x^2 + y^2 + z^2 = 4$.

5. Evaluate the surface integral $\iint_S \sqrt{1 + x^2 + y^2}\, dS$, where S is the helicoid with vector equation $\mathbf{r}(u, v) = u \cos v\, \mathbf{i} + u \sin v\, \mathbf{j} + v\, \mathbf{k}$, $0 \le u \le 1$, $0 \le v \le \pi$.

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