Score: _____

Name: _____

Worksheet 7 - Section 15.8, 15.9 (Due Tues, Nov. 11)

Math 2110Q – Fall 2014

Professor Hohn

You must show all of your work to receive full credit!

1. Convert the following into an integral in cylindrical coordinates.

$$\int_{-1}^{1}\int_{0}^{\sqrt{1-y^2}}\int_{x^2+y^2}^{\sqrt{x^2+y^2}} xyz\,dz\,dx\,dy$$

2. Convert the following into an integral in spherical coordinates.

$$\int_0^3 \int_0^{\sqrt{9-y^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{18-x^2-y^2}} (x^2+y^2+z^2)\, dz\, dx\, dy$$

3. Let $\rho(x, y, z)$ be the density function of a solid object that occupies the region E (in units of mass per unit volume). At any given point (x, y, z), its mass is

$$m = \iiint_E \rho(x, y, z)\, dV.$$

Find the mass of the solid E bounded by the parabolic cylinder $z = 1 - y^2$ and the planes $x + z = 1$, $x = 0$ and $z = 0$ with density function $\rho(x, y, z) = 4$.

4. A model for the density δ of the earth's atmosphere near its surface is

$$\delta = 619.09 - 0.000097\rho$$

where ρ (the distance from the center of the earth) is measured in meters and δ is measured in kilograms per cubic meter. If we take the surface of the earth to be a sphere with radius $6.370 \times 10^6 \leq \rho \leq 6.375 \times 10^6$. Use this model to estimate the mass of the atmosphere between the ground and an altitude of 5 km.