Homework 3

Math 324F
Advanced Multivariable Calculus
Due on 21st October 2015

Problem 15.9.35 (6 points) Find the volume of the solid E that lies above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = 1$.

Problem 15.9.40 (6 points) Evaluate the integral by changing to spherical coordinates

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

Problem 15.10.13 (6 points) Find a transformation T that maps a rectangular region S with sides parallel to u and v axes in the uv plane onto the region R in the xy plane bounded by the hyperbolas $y = \frac{1}{x}$, $y = \frac{4}{x}$ and the lines $y = x$, $y = 4x$ in the first quadrant.

Problem 15.10.21 a) (6 points) Find the volume of the solid E enclosed by the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. Use the transformation $x = au$, $y = bv$, $z = cw$.

Problem 15.10.27 (6 points) Use appropriate change of variables to evaluate $\iint_R e^{x+y}\, dA$ where R is given by the inequality $|x| + |y| \leq 1$.