Calculus 3 - Summer 2012
Homework #6
Due 7/16/2012

Written Problems

1. Find the volume of the smaller solid bounded by $x^2 + y^2 + z^2 = R^2$ and $x = \dfrac{1}{\sqrt{3}}\sqrt{y^2 + z^2}$.

2. Find the volume of the tetrahedron bounded by planes

$$\begin{aligned} 3x + 4y + z &= 11 & \qquad y &= x + 2 \\ x + 5y + z &= 7 & \qquad y &= -x - 6 \end{aligned}$$

by transforming it into the tetrahedron bounded by

$$\frac{u}{a} + \frac{v}{b} + \frac{w}{c} = 1,\ u = 0,\ v = 0,\ w = 0$$

and using the fact that the volume of the new tetrahedron is $\dfrac{|abc|}{3!}$.

3. Compute $\dfrac{\partial(x, y, z)}{\partial(\rho, \phi, \theta)}$ for $(x, y, z) = (\rho \sin\phi \cos\theta, \rho \sin\phi \sin\theta, \rho \cos\phi)$.

Presentation Problems

4. (a) Find the average value of r over the cylinder $x^2 + y^2 \leq R^2$, $0 \leq z \leq H$.
   (b) Find the average value of ρ over the sphere $x^2 + y^2 + z^2 \leq R^2$.

5. Evaluate: $\displaystyle\int_0^2 \int_{\frac{y}{2}}^{\frac{y+4}{2}} y^3(2x - y)e^{(2x-y)^2}\, dx\, dy$.

6. Find the volume between $z = 13 - 2x^2$ and $z = 4x^2 + 6y^2 - 41$.