Math 2130 Homework 8: 16.4-16.5

For problems 1, 2, 4, 5 and 6 please circle not only your final answer, but also the iterated integral you need to set up.

1) Find the average value of the spherical coordinate $\phi$ over the region defined by the inequalities $x^2 + y^2 + z^2 \leq 1$ and $z \geq 0$.

2) Evaluate

$$\int_{x=-\infty}^{x=\infty} \int_{y=-\infty}^{y=\infty} e^{-x^2-y^2} dydx$$

By converting to polar coordinates.

3) What integration rule allows you to rewrite $\int_{x=-\infty}^{x=\infty} \int_{y=-\infty}^{y=\infty} e^{-x^2-y^2} dydx$ as:

$$\left(\int_{x=-\infty}^{x=\infty} e^{-x^2} dx\right) \left(\int_{y=-\infty}^{y=\infty} e^{-y^2} dy\right)$$

Use your answer to the previous problem to work out what $\int_{x=-\infty}^{x=\infty} e^{-x^2} dx$ is.

4) Use cylindrical coordinates to find

$$\int_{R} xy^2 + yz^2 dV$$

where $R$ is the wedge satisfying the inequalities $z \geq 0$, $z \leq 1$, $x \geq 0$, $x \geq y$, $y \geq 0$ and $x^2 + y^2 \leq 1$.

5) Use cylindrical coordinates to find the volume of the region $R$ satisfying the inequalities $0 \leq z \leq y$ and $x^2 + y^2 \leq 1$. Careful! This also means that $y \geq 0$.

6) Use spherical coordinates to find

$$\int_{R} xzdV$$

where $R$ is the region between the spheres $\rho = 1$ and $\rho = 2$ and satisfying $x \geq 0$, $y \geq 0$ and $z \geq 0$. 