Cylindrical Coordinates

Concept:
Computation: To convert from rectangular to cylindrical, use $z = z$, $r = \sqrt{x^2 + y^2}$, $\theta = \tan^{-1}(\frac{x}{y})$
To convert from cylindrical to regtangular, use $z = z, x = r\cos\theta$, $y = r\sin\theta$
To integrate in cylindrical, use $dV = r\ drd\theta dz$

These problems are the Ch 12 practice problems on Prof. Mittal's website, page 16-17

2. Convert $\int_0^3 \int_0^{\sqrt{9-y^2}} \int_0^{\sqrt{9-x^2-y^2}} \sqrt{x^2+y^2} dzdxdy$ into a triple integral in cylindrical coordinates. Sketch the solid determined by the limits.

3. The cylinder $x^2 + y^2 = 4$, $z \geq 0$ is sliced by the plane $z = 4 + y$. Determine the volume of the "sliced" cylinder.

4. Draw the solid that is bounded above by a portion of the hemisphere $z = \sqrt{1 - x^2 - y^2}$ and below by the cone $z = \sqrt{3x^2 + 3y^2}$. Set up a triple integral that gives the volume of the solid, and then find it's volume.