Review Practice: Chapter 15

Formulas:

$$\sin^2\theta = \frac{1-\cos 2\theta}{2} \qquad \cos^2\theta = \frac{1+\cos 2\theta}{2}$$

Cylindrical Coordinates:

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$z = z$$
$$x^2+y^2=r^2$$
$$dA = r\ dr\ d\theta$$

Sphereical Coordinates:

$$x = \rho\sin\phi\cos\theta$$
$$y = \rho\sin\phi\sin\theta$$
$$z = \rho\cos\phi$$
$$x^2+y^2+z^2=\rho^2$$
$$dV = \rho^2\sin\phi\ d\rho\ d\theta\ d\phi$$

1. Sketch the region of integration for: $\displaystyle\int_0^3\int_{-\sqrt{16-x^2}}^{\sqrt{16-x^2}} f(x,y)\ dy\ dx$ and change the order of integration.

2. Use polar coordinates to evaluate: $\displaystyle\int_0^4\int_{-\sqrt{16-x^2}}^{\sqrt{16-x^2}} \sec^2(x^2+y^2)\ dy\ dx$

3. Set up a single triple integral to find the volume between the spheres: $x^2+y^2+z^2=4$ and $x^2+y^2+z^2=1$ inside the cylinder $x^2+y^2=1$.

4. Evaluate $\int\int\int_E z\ dV$ where E is the region described in 3.

5. Use sphereical coordinates to evaluate $\int\int\int_E xy\ dV$ where E is the region above the xy-plane between the spheres $x^2+y^2+z^2=4$ and $x^2+y^2+z^2=1$.