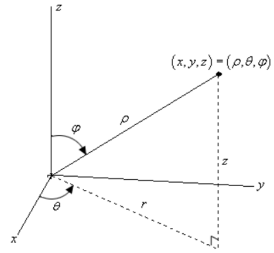


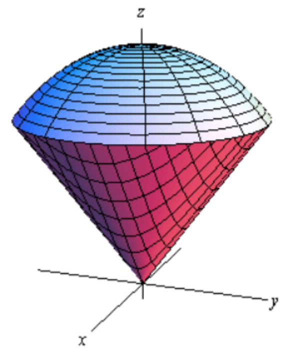
Conversion formulas for spherical coordinates:

$$x = \rho \sin\varphi \cos\theta \qquad y = \rho \sin\varphi \sin\theta \qquad z = \rho \cos\varphi$$

$$x^2 + y^2 + z^2 = \rho^2$$

$$\rho \geq 0 \qquad 0 \leq \varphi \leq \pi$$

We will be slicing our solid into spherical wedges to calculate the integrals:



Triple Integrals in Spherical Coordinates:

$$\iiint\limits_E f(x,y,z)\, dV = \int_\delta^\gamma \int_\alpha^\beta \int_a^b \rho^2 \sin\varphi \ f(\rho\sin\varphi\cos\theta, \rho\sin\varphi\sin\theta, \rho\cos\varphi)\ d\rho\, d\theta\, d\varphi$$

Evaluate $\iiint\limits_E 16z\, dV$ where E is the upper half of the sphere $x^2 + y^2 + z^2 = 1$.

Evaluate $\iiint\limits_E 10xz + 3\,dV$ where E is the region portion of $x^2 + y^2 + z^2 = 16$ with $z \geq 0$.

Evaluate $\iiint\limits_E 3z\,dV$ where E is the region inside both $x^2 + y^2 + z^2 = 1$ and $z = \sqrt{x^2 + y^2}$.

Evaluate $\iiint\limits_E z\,x\,dV$ where E is inside both $x^2 + y^2 + z^2 = 4$ and the cone (pointing upward) that makes an angle of $\frac{\pi}{3}$ with the negative z-axis and has $x \leq 0$.

Convert $\int_0^3 \int_0^{\sqrt{9-y^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{18-x^2-y^2}} x^2 + y^2 + z^2 \, dz \, dx \, dy$ into spherical coordinates.