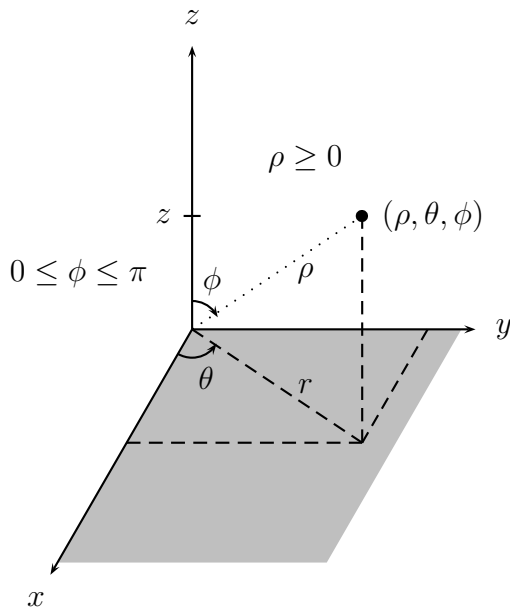


Cylindrical Coordinates

$$\begin{aligned}x &= r \cos \theta \\y &= r \sin \theta \\z &= z\end{aligned}$$

$$\begin{aligned}r^2 &= x^2 + y^2 \\ \tan \theta &= y/x \\ z &= z\end{aligned}$$

$$dV = r \, dr \, d\theta \, dz$$



Spherical Coordinates

$$\begin{aligned}x &= \rho \sin \phi \cos \theta \\y &= \rho \sin \phi \sin \theta \\z &= \rho \cos \phi\end{aligned}$$

$$\begin{aligned}\rho^2 &= x^2 + y^2 + z^2 \\ \tan \theta &= y/x \\ \phi &= \cos^{-1}(z/\rho)\end{aligned}$$

θ is the same angle used in cylindrical coordinates for $r \geq 0$.

$$dV = \rho^2 \sin \phi \, d\rho \, d\theta \, d\phi$$