

## B3D Handout 4: Spherical polar coordinates

These are fully three-dimensional polar coordinates, and are used in lots of situations where there is a natural spherical symmetry (e.g. electron orbits).

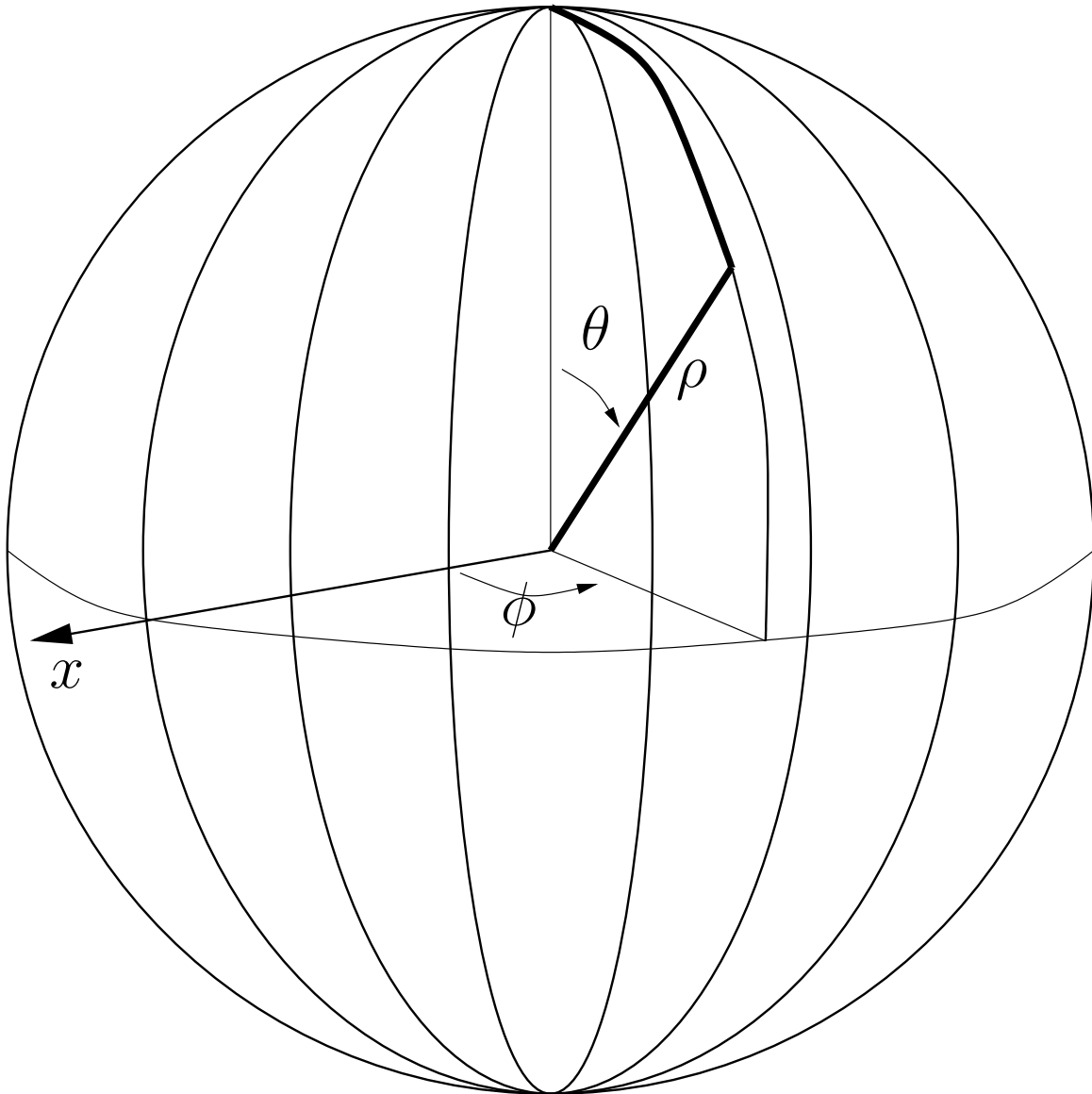
$$\rho \quad 0 \leq \rho < \infty$$

$$\theta \quad 0 \leq \theta \leq \pi$$

$$\phi \quad 0 \leq \phi < 2\pi$$

They are related to rectangular coordinates by

$$x = \rho \sin \theta \cos \phi \quad y = \rho \sin \theta \sin \phi \quad z = \rho \cos \theta$$



In the above equations,  $\theta$  is the latitude or polar angle, and  $\phi$  is the longitude.