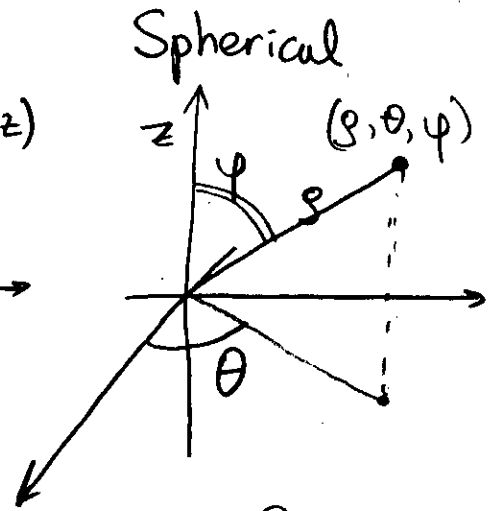
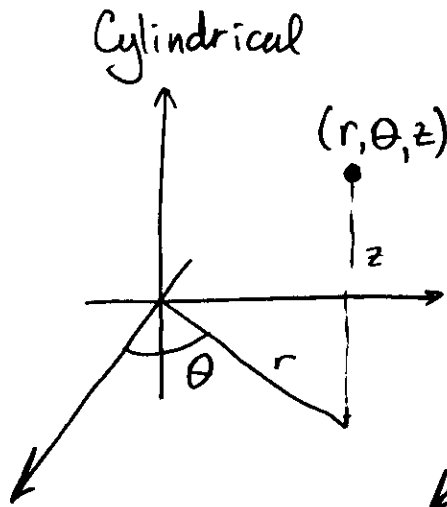
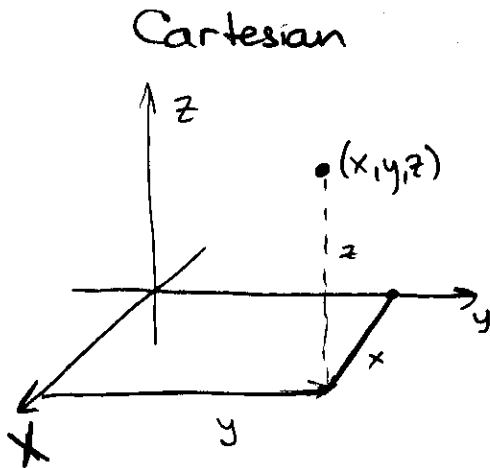


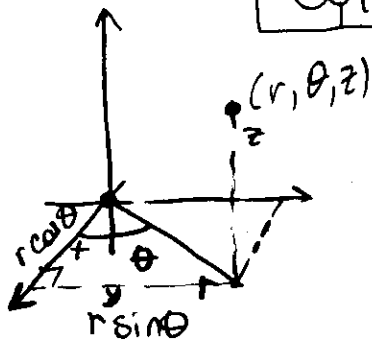
Cylindrical and spherical coordinates.



Relationship Between Coordinate Systems

Cylindrical to Car

Cartesian to Cylindrical



$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$z = z$$

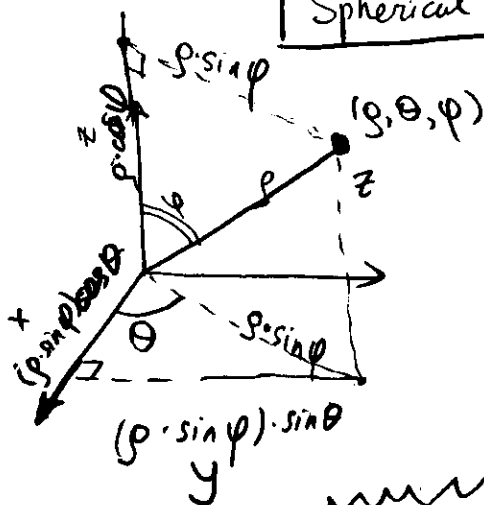
$$r = \sqrt{x^2 + y^2}$$

$$\theta = \arctan\left(\frac{y}{x}\right) = \arccos\frac{x}{\sqrt{x^2 + y^2}}$$

$$z = z$$

Spherical to Cartesian

Cartesian to spherical



$$x = r \sin \phi \cos \theta$$

$$y = r \sin \phi \sin \theta$$

$$z = r \cos \phi$$

$$\rho = \sqrt{x^2 + y^2 + z^2}$$

$$\theta = \arctan\left(\frac{y}{x}\right)$$

$$\phi = \arccos\frac{z}{\sqrt{x^2 + y^2 + z^2}}$$

$$= \arctan\frac{z}{\sqrt{x^2 + y^2}}$$

Why Cylindrical are cylindrical and why spherical are spherical?

