

2.5 Given point $T(10, 60^\circ, 30^\circ)$ in spherical coordinates, express T in Cartesian and cylindrical coordinates.

$$T(r=10, \theta=60^\circ, \phi=30^\circ)$$

Convert to Cartesian coordinates

$$x = r \sin \theta \cos \phi = 10 \sin 60^\circ \cos 30^\circ = 7.5$$

$$y = r \sin \theta \sin \phi = 10 \sin 60^\circ \sin 30^\circ = 4.33$$

$$z = r \cos \theta = 10 \cos 60^\circ = 5$$

$$\underline{\underline{T_{\text{cart}}(7.5, 4.33, 5)}}$$

Convert to Cylindrical coordinates

$$\rho = \sqrt{x^2 + y^2} = \sqrt{7.5^2 + 4.33^2} = 8.660$$

$$\phi = \phi = 30^\circ$$

$$z = z = 5$$

$$\underline{\underline{T_{\text{cyl}}(8.66, 30^\circ, 5)}}$$