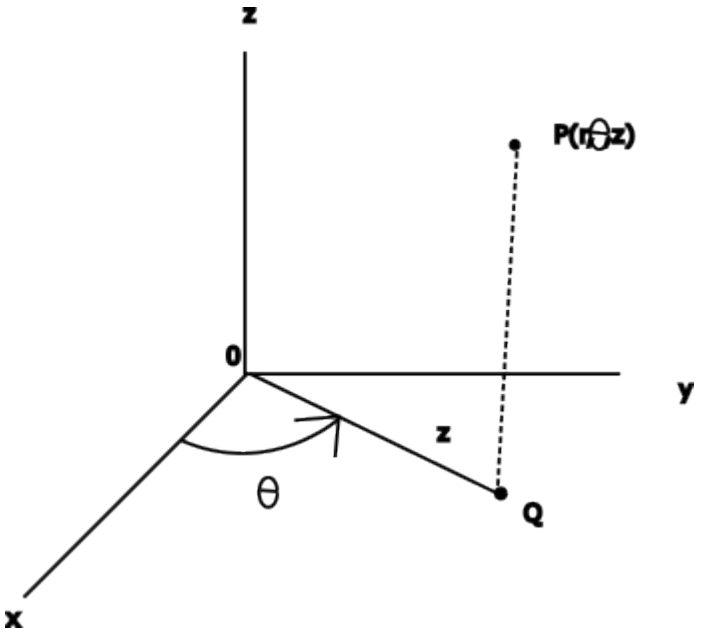
1 Cylindrical Coordinates



Cylindrical to rectangular:

$x = r\cos\theta$
$y = r\sin\theta$
$z = z$

1.1 Cylindrical Coordinates Example 2

Find the cylindrical coordinates for:
$Q(x, y, z) = Q(2, -2, 3)$

$$r^2 = x^2 + y^2 = 4 + 4 = 8 \tag{1}$$

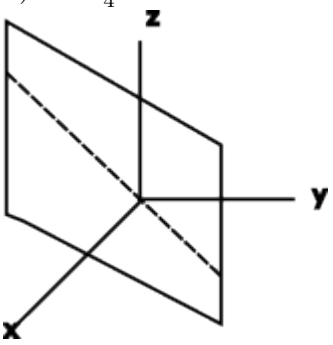
$$r = +-2\sqrt{2} \tag{2}$$

$$\tan\theta = \frac{y}{x} = \frac{-2}{2} = -2 \Rightarrow \theta = -\frac{\pi}{4} + \pi n \tag{3}$$

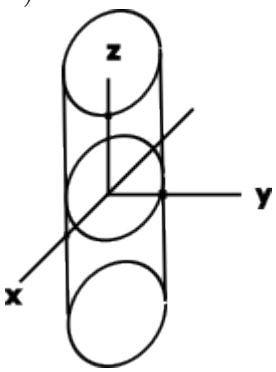
1.2 Cylindrical Coordinates Example 3

Sketch

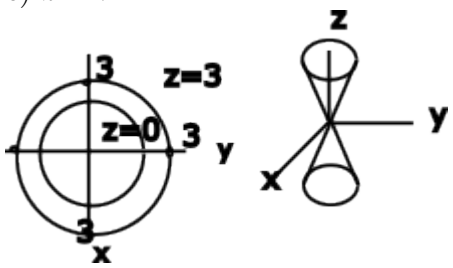
a) $\theta = \frac{\pi}{4}$



b) $r = 2$



c) $z = r$



1.3 Cylindrical Coordinates Example 4

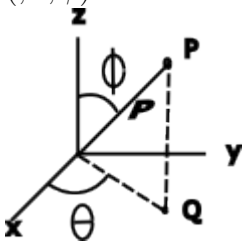
Consider $x^2 + y^2 - z^2 = 1$

a) Classify this quadric surface

Hyperboloid of <u>one</u> sheet
b) Find a cylindrical equation for this surface
$x^2 + y^2 = r^2$
$r^2 - z^2 = 1$
$r^2 = z^2 + 1$

2 Spherical Coordinates

$(, \theta, \phi)$



2.1 Spherical Coordinates Example 1

Convert $P(2, \frac{\pi}{3}, \frac{\pi}{4})$ From spherical to rectangular coordinate

2.2 Spherical Coordinates Example 2

Convert $Q(2\sqrt{3}, 0, -2)$ from rectangular to spherical coordinates.

2.3 Spherical Coordinates Example 3

Find a spherical coordinates equation for the given rectangular equation.
$x^2 + y^2 - z^2 = 1$, hyperboloid of one sheet
hi

2.4 Spherical Coordinates Example 4

Find a rectangular coordinates equation for the given spherical equation. If possible, identify the object.
a)roe $= 1$
b)roe $= 2\cos\theta\sin\phi$
c)(roe)$\sin\phi = 2$