

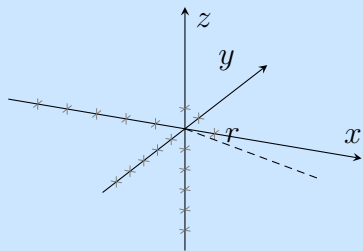
# Cylindrical and Spherical Coordinates

## Cylindrical Coordinates

1. Plot the following points whose cylindrical coordinates are given

(a)  $4, \pi/3, -2$

**Solution:**



(b)  $4, 0, 2$

**Solution:**

2. Convert from rectangular to cylindrical coordinates:

(a)  $(-1, 1, 1)$

**Solution:**

(b)  $(-2, 2\sqrt{3}, 3)$

**Solution:**

3. Convert from cylindrical coordinates to rectangular coordinates

(a)  $(4, \pi/3, -2)$

**Solution:**

(b)  $(4, 0, 2)$

**Solution:**

4. Sketch the solid described by the following

(a)

$$0 \leq r \leq 2, \quad -\pi/2 \leq \theta \leq \pi/2, \quad 0 \leq z \leq 1$$

**Solution:**

(b)

$$0 \leq \theta \leq \pi/2, \quad r \leq z \leq 2$$

**Solution:**

5. Describe in words or draw a rough sketch of the surface whose equation is given

(a)  $\theta = \pi/4$

**Solution:**

(b)  $r = 15$

**Solution:**

(c)  $z = 4 - r^2$

**Solution:**

(d)  $2r^2 + z^2 = 1$

**Solution:**

6. Convert the given equation to cylindrical coordinates

(a)  $x^2 - 4x + y^2 + z^2 = 1$

**Solution:**

(b)  $z = x^2 - y^2$

**Solution:**

## Spherical Coordinates

7. Plot the following points whose spherical coordinates are given then find the rectangular coordinates for the same point.

(a)  $(6, \pi/3, \pi/6)$

**Solution:**

(b)  $(3, \pi/2, 3\pi/4)$

**Solution:**

8. Convert from rectangular to spherical coordinates:

(a)  $(0, -2, 0)$

**Solution:**

(b)  $(1, 0, \sqrt{3})$

**Solution:**

9. Identify or describe in words or sketch the surface whose equation is given

(a)  $\rho = 3$

**Solution:**

(b)  $\rho = \sin \theta \sin \phi$

**Solution:**

10. Write the equation in spherical coordinates

(a)  $z^2 = x^2 + y^2$

**Solution:**

(b)  $x + 2y + 3z = 1$

**Solution:**

(c)  $x^2 + z^2 = 9$

**Solution:**