

1) Convert the point from cylindrical coordinates to rectangular coordinates.

- a)  $(-7, 0, 5)$
- b)  $\left(6, -\frac{\pi}{4}, 2\right)$

a)  $(-7, 0, 5)$

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

2) Convert the point from rectangular coordinates to cylindrical coordinates.

- a)  $(0, 5, 1)$
- b)  $(2\sqrt{2}, -2\sqrt{2}, 4)$

a)  $\left(5, \frac{\pi}{2}, 1\right)$

b)  $\left(4, -\frac{\pi}{4}, 4\right)$

3) Find an equation in cylindrical coordinates for the equation given in rectangular coordinates.

- a)  $z = 3$
- b)  $x = 9$
- c)  $x^2 + y^2 + z^2 = 17$
- d)  $y = x^2$

a)  $z = 3$

b)  $r = 9 \sec \theta$

c)  $r^2 + z^2 = 17$

d)  $r = \sec \theta \tan \theta$

4) Find an equation in rectangular coordinates for the equation given in cylindrical coordinates.

a)  $r = 3$

b)  $z = 2$

a)  $\theta = \frac{\pi}{6}$

b)  $r = 2 \cos \theta$

a)  $x^2 + y^2 = 9$

b)  $z = 2$

c)  $x - \sqrt{3}y = 0$

d)  $(x-1)^2 + y^2 = 1$

5) Convert the point from rectangular coordinates to spherical coordinates.

a)  $(4, 0, 0)$

b)  $(-1, 2, 1)$

a)  $\left(4, 0, \frac{\pi}{2}\right)$

b)  $\left(\sqrt{6}, \tan^{-1}(-2) + \pi, \cos^{-1} \frac{1}{\sqrt{6}}\right)$

6) Convert the point from spherical coordinates to rectangular coordinates.

a)  $\left(4, \frac{\pi}{6}, \frac{\pi}{4}\right)$

b)  $\left(6, \pi, \frac{\pi}{2}\right)$

a)  $\left(\sqrt{6}, \sqrt{2}, 2\sqrt{2}\right)$

b)  $(-6, 0, 0)$

7) Find an equation in spherical coordinates for the equation given in rectangular coordinates.

- a)  $y = 2$
- b)  $z = 6$
- c)  $x^2 + y^2 + z^2 = 49$
- d)  $x^2 + y^2 = 2z^2$

- a)  $\rho = 2 \csc \phi \csc \theta$
- b)  $\rho = 6 \sec \phi$
- c)  $\rho = 7$
- d)  $\tan \phi = \pm \sqrt{2}$

8) Find an equation in rectangular coordinates for the equation given in spherical coordinates.

- a)  $\rho = 5$
- b)  $\theta = \frac{3\pi}{4}$
- c)  $\phi = \frac{\pi}{6}$
- d)  $\rho = 4 \csc \phi \sec \theta$

- a)  $x^2 + y^2 + z^2 = 25$
- b)  $x + y = 0$
- c)  $3x^2 + 3y^2 - z^2 = 0, z \geq 0$
- d)  $x = 4$

9) Convert the point from cylindrical coordinates to spherical coordinates.

a)  $\left(4, \frac{\pi}{4}, 0\right)$

b)  $\left(2, \frac{2\pi}{3}, -2\right)$

a)  $\boxed{\left(4, \frac{\pi}{4}, \frac{\pi}{2}\right)}$

b)  $\boxed{\left(2\sqrt{2}, \frac{2\pi}{3}, \frac{3\pi}{4}\right)}$

10) Convert the point from spherical coordinates to cylindrical coordinates.

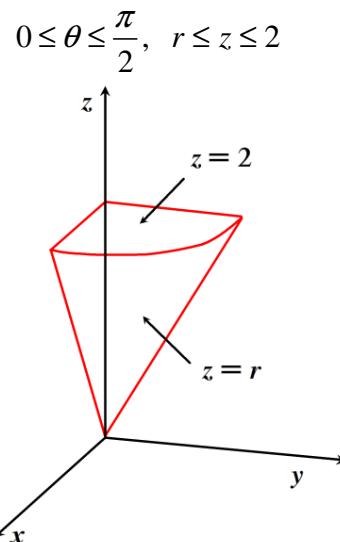
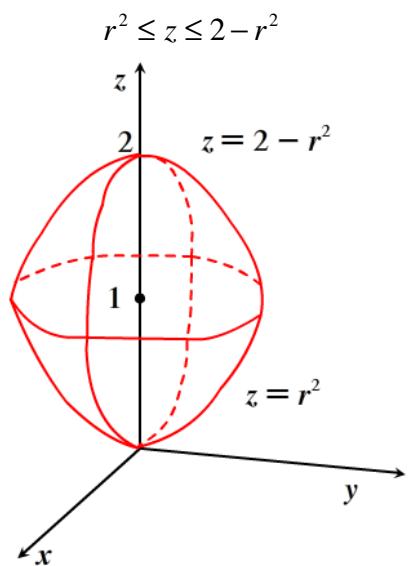
a)  $\left(10, \frac{\pi}{6}, \frac{\pi}{2}\right)$

b)  $\left(18, \frac{\pi}{3}, \frac{\pi}{3}\right)$

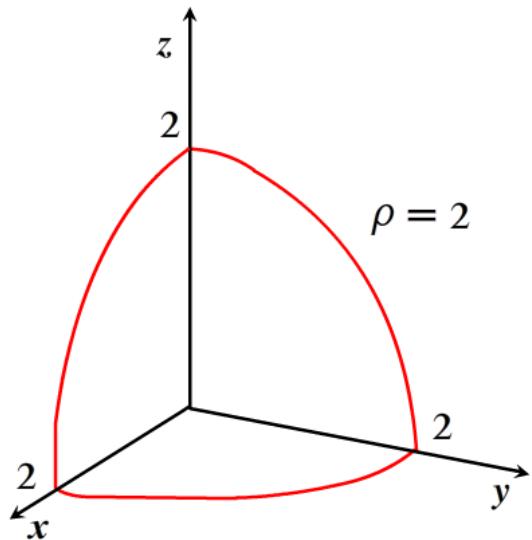
a)  $\boxed{\left(10, \frac{\pi}{6}, 0\right)}$

b)  $\boxed{\left(9, \frac{\pi}{3}, 9\sqrt{3}\right)}$

11) Sketch the graph described by the given inequalities.



$$\rho \leq 2, \quad 0 \leq \phi \leq \frac{\pi}{2}, \quad 0 \leq \theta \leq \frac{\pi}{2}$$



$$\rho \leq 2, \quad 0 \leq \phi \leq \frac{\pi}{3}$$

