Online Homework

Problem 1 *Find the Cartesian coordinates of the point* $(\pi/2, \pi, 2)$*, given in cylindrical coordinates.*

$$(x, y, z) = \boxed{(0, -\pi/2, 2)}$$

Problem 2 *Find the Cartesian coordinates of the point* $(2, \pi, \pi/2)$*, given in spherical coordinates.*

$$(x, y, z) = \boxed{(-2, 0, 0)}$$

Problem 3 *Find cylindrical coordinates for the point* $(0, -1, 3)$*, written in Cartesian coordinates. Your answer should satisfy* $0 \leq r$ *and* $0 \leq \theta < 2\pi$*.*

$$(r, \theta, z) = \boxed{(1, \pi, 3)}$$

Problem 4 *Find spherical coordinates for the point* $\left(-\sqrt{2}, \sqrt{2}, 2\sqrt{3}\right)$*, written in Cartesian coordinates. Your answer should satisfy* $0 \leq \rho$*,* $0 \leq \theta \leq 2\pi$*, and* $0 \leq \phi \leq \phi$*.*

$$(\rho, \theta, \phi) = \boxed{(4, 3\pi/4, \pi/6)}$$

Problem 5 *Consider the surface described in Cartesian coordinates by*

$$2z^2 = x^2 + y^2.$$

Learning outcomes:
Author(s):

Describe this surface with an equation in cylindrical coordinates, of the form $0 = f(r, \theta, z)$.

$$0 = \boxed{r^2 - 2z^2}$$

FIGURE OUT HOW TO HANDLE THIS!!! What type of shape is this?

Multiple Choice:

(a) *Plane*

(b) *Cylinder*

(c) *Sphere*

(d) *Cone* ✓

(e) *Other*

Problem 6 *Consider the surface described in Cartesian coordinates by*

$$2z^2 = x^2 + y^2.$$

Describe this surface with an equation in spherical coordinates, of the form $0 = f(\rho, \theta, \phi)$.

$$0 = \boxed{\rho^2 \sin^2 \phi - 2\cos^2 \phi}$$

FIGURE OUT HOW TO HANDLE THIS!!! What type of shape is this?

Multiple Choice:

(a) *Plane*

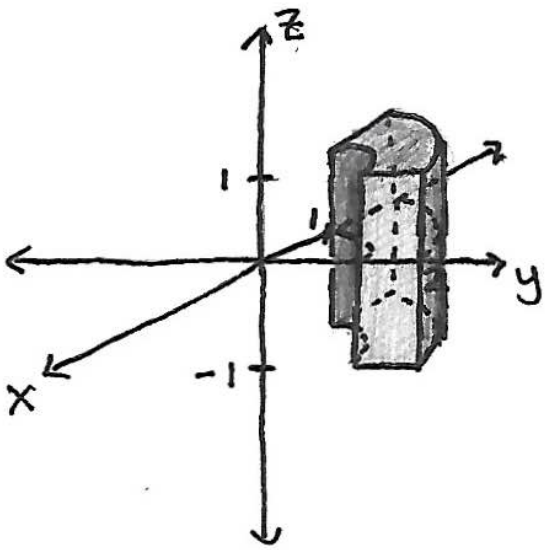
(b) *Cylinder*

(c) *Sphere*

(d) *Cone* ✓

(e) *Other*

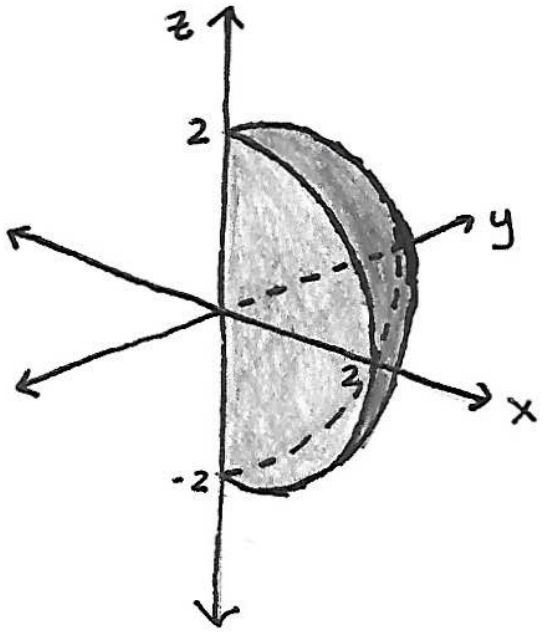
Problem 7 *Consider the following region in* $\mathbb{R}^3$.



This region is the set of points (r, θ, z), in cylindrical coordinates, satisfying the inequalities

$$\boxed{1} \leq r \leq \boxed{2}$$
$$\boxed{\pi/2} \leq \theta \leq \boxed{\pi}$$
$$\boxed{-1} \leq z \leq \boxed{1}$$

Problem 8 *Consider the following region in $\mathbb{R}^3$.*



This region is the set of points (ρ, θ, ϕ), in spherical coordinates, satisfying the inequalities

$$\boxed{0} \leq \rho \leq \boxed{2}$$
$$\boxed{0} \leq \theta \leq \boxed{pi/2}$$
$$\boxed{0} \leq \phi \leq \boxed{pi}$$

Problem 9 *For each of the following equations in cylindrical coordinates, select the type of shape they define.*

FIGURE OUT CORRECT ANSWERS

$r = \cos\theta$

Multiple Choice:

(a) *plane*

(b) *cylinder*

(c) *sphere*

(d) *other*

$z = r\cos\theta$

Multiple Choice:

(a) *plane*

(b) *cylinder*

(c) *sphere*

(d) *other*

$z = -r$

Multiple Choice:

(a) *plane* ✓

(b) *cylinder*

(c) *sphere*

(d) *other*

Problem 10 *For each of the following equations in spherical coordinates, select the type of shape they define.*

FIGURE OUT CORRECT ANSWERS

$\rho = \cos\phi$

Multiple Choice:

(a) *plane*

(b) *cylinder*

(c) *sphere*

(d) *other*

$\rho = \sin\theta$

Multiple Choice:

(a) *plane*

(b) *cylinder*

(c) *sphere*

(d) *other*

$\rho \cos\theta \sin\phi = 1$

Multiple Choice:

(a) *plane* ✓

(b) *cylinder*

(c) *sphere*

(d) *other*