

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 $(-\sqrt{2}, \sqrt{2}, 2\sqrt{3})$, written in Cartesian coordinates. Your answer should satisfy $0 \leq \rho$, $0 \leq \theta \leq 2\pi$, and $0 \leq \phi \leq \pi$.

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

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 .

IMAGE

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

$$\begin{aligned} 1 &\leq r \leq 2 \\ \pi/2 &\leq \theta \leq \pi \\ -1 &\leq z \leq 1 \end{aligned}$$

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

IMAGE

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

$$\begin{aligned} 0 &\leq \rho \leq 2 \\ 0 &\leq \theta \leq \pi/2 \\ 0 &\leq \phi \leq \pi \end{aligned}$$

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:

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- (a) *plane* ✓
 - (b) *cylinder*
 - (c) *sphere*
 - (d) *other*
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