

Section 10.4 Lines and Planes in Space

Objective: In this lesson you learned how to find parametric and symmetric equations of lines in space and find distances between points and planes in space.

Course Number

Instructor

Date

I. Lines in Space (Pages 764–765)

For the line L through the point $P = (x_1, y_1, z_1)$ and parallel to the vector $\mathbf{v} = \langle a, b, c \rangle$, the vector \mathbf{v} is the _____ for the line L , and the values a , b , and c are the _____.

One way of describing the line L is . . .

A line L parallel to the nonzero vector $\mathbf{v} = \langle a, b, c \rangle$ and passing through the point $P = (x_1, y_1, z_1)$ is represented by the following parametric equations, where t is the parameter:

If the direction numbers a , b , and c are all nonzero, you can eliminate the parameter t to obtain the **symmetric equations** of a line:

What you should learn

How to find parametric and symmetric equations of lines in space

II. Planes in Space (Pages 766–768)

The plane containing the point (x_1, y_1, z_1) and having nonzero normal vector $\mathbf{n} = \langle a, b, c \rangle$ can be represented by the **standard form of the equation of a plane**, which is

By regrouping terms, you obtain the **general form of the equation of a plane** in space:

To find a normal vector to a plane given the general form of the equation of the plane, . . .

What you should learn

How to find equations of planes in space

Two distinct planes in three-space either are _____
or _____.

If two distinct planes intersect, the **angle θ between the two planes** is equal to the angle between vectors \mathbf{n}_1 and \mathbf{n}_2 normal to the two intersecting planes, and is given by

Consequently, two planes with normal vectors \mathbf{n}_1 and \mathbf{n}_2 are

1. _____ if $\mathbf{n}_1 \cdot \mathbf{n}_2 = 0$.
2. _____ if \mathbf{n}_1 is a scalar multiple of \mathbf{n}_2 .

III. Sketching Planes in Space (Page 769)

If a plane in space intersects one of the coordinate planes, the line of intersection is called the _____ of the given plane in the coordinate plane.

To sketch a plane in space, . . .

The plane with equation $3y - 2z + 1 = 0$ is parallel to
_____.

What you should learn
How to sketch planes in space

IV. Distance Between a Point and a Plane (Page 770)

The **distance between a plane and a point Q** (not in the plane) is

where P is a point in the plane and \mathbf{n} is normal to the plane.

What you should learn
How to find distances between points and planes in space

Homework Assignment

Page(s)

Exercises