5. Intersection of planes

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Practice

Two Planes

6/6 points (graded)

Let $\mathcal{P}_1$ be the plane $x - z = 2$ and $\mathcal{P}_2$ be the plane $2x - y - 3z = 7$.

Find two distinct points (x_0, y_0, z_0) and (x_1, y_1, z_1) that belong to the intersection of $\mathcal{P}_1$ and $\mathcal{P}_2$.

$x_0 =$ 2 ✔ **Answer:** 2

$y_0 =$ -3 ✔ **Answer:** -3

$z_0 =$ 0 ✔ **Answer:** 0

$x_1 =$ 0 ✔ **Answer:** 0

$y_1 =$ -1 ✔ **Answer:** -1

$z_1 =$ -2 ✔ **Answer:** -2

Solution:

The intersection of the two planes consists of all points x, y, z that satisfy both equations:

$$x - z = 2 \qquad 2x - y - 3z = 7 \tag{5.90}$$

There are several ways of finding solutions to this system. One method is to just set variables equal to 0 until the system has a unique solution. If we set $z = 0$ then we get the system

$$x = 2 \qquad 2x - y = 7 \tag{5.91}$$

This already gives us $x = 2$. Substituting this value for x into the second equation, we find $y = -3$. Thus the point $(2, -3, 0)$ belongs to both planes.

To find the second point, we can set $x = 0$. This gives the system

$$-z = 2 - y - 3z = 7 \tag{5.92}$$

We see $z = -2$ and therefore $y = -1$. So the point $(0, -1, -2)$ also belongs to both planes.

Submit You have used 1 of 5 attempts

Answers are displayed within the problem

Shape of solution

1/1 point (graded)

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Let $\mathcal{P}_1$ and $\mathcal{P}_2$ be as in the previous problem. The intersection of $\mathcal{P}_1$ and $\mathcal{P}_2$ is...

a line ✔ **Answer:** a line

Solution:

By the previous problem, the intersection contains at least two points, so the intersection is not empty, and not just a single point.

The planes are not parallel, since the normal vectors do not point in the same direction. So the intersection is not empty.

The only remaining options is a line.

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Answers are displayed within the problem

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Topic: Unit 4: Matrices and Linearization / 5. Intersection of planes

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The phrase "Enter an equation using notation such as x+y+1=4*z." seems confusing 1
The phrase "Enter an equation using notation such as x+y+1=4*z." seems confusing in this particular task, because we asked to find...

[STAFF] Typo in solution 1
In Eqs (5.90) and (5.91) there is a typo. Instead of "22", the 2's should be separated by a line break so that the second 2 starts a new...

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