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5. Intersection of planes

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Recitation due Sep 15, 2021 20:30 IST



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 .

$$x_0 = \boxed{}$$
 Answer: 2

$$y_0 = \boxed{$$
 -3

$$oldsymbol{x_1} = oldsymbol{lack} 0$$
 Answer: 0

$$y_1 = \boxed{ \ \ \ }$$
 Answer: -1

$$z_1 = \boxed{ -2 }$$
 Answer: -2

Solution:

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

$$x - z = 2 2x - y - 3z = 7 (5.90)$$

There are several ways of finding solutions to this system. One method is to just set variables equal to $\bf 0$ until the system has a unique solution. If we set $z=\bf 0$ 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 $oldsymbol{x}=oldsymbol{0}$. This gives the system

$$-z = 2 - y - 3z = 7 (5.92)$$

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

1 Answers are displayed within the problem

Shape of solution

1/1 point (graded)



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.

Submit

You have used 1 of 2 attempts

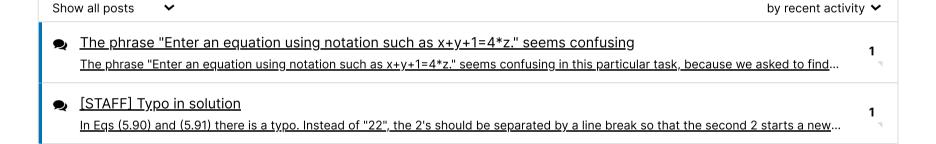
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5. Intersection of planes

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