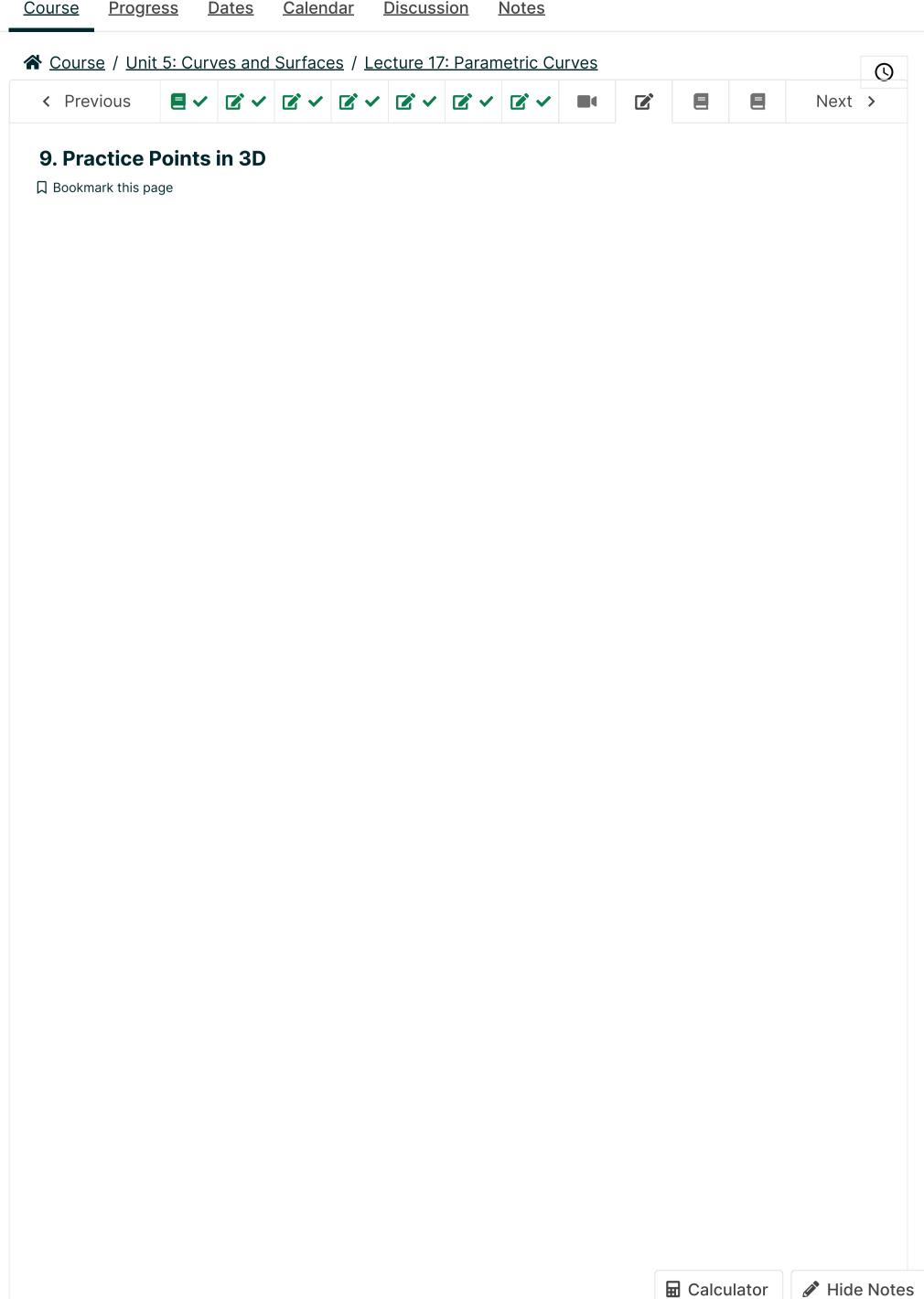
<u>Help</u>

sandipan\_dey >

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Lecture due Oct 5, 2021 20:30 IST



**Practice** 

#### Points in 3D

1/1 point (graded)

Let  $P_0=(1,2,5)$  and  $P_1=(-2,1,6).$  Consider the plane given by -x-3y+z=12.

Are  $P_0$  and  $P_1$  on the same side of the plane, opposite sides, or is one in the plane?

They are on the same side.



They are on opposite sides.



One is in the plane.



#### Solution:

We can substitute the x,y, and z values of  $P_0$  and  $P_1$  into the equation for the plane. For  $P_0$ , the left-hand-side becomes -1-3 (2)+5=-2. Since -2<12, we conclude that  $P_0$  is not the plane.

For  $P_1$ , the left-hand-side becomes 2-3+6=5. Since 5<12, we conclude that  $P_1$  is also not in the plane.

Since both points led to a < 12 result, both points are in the same "half-space" described by -x-3y+z<12

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You have used 1 of 1 attempt

**1** Answers are displayed within the problem

### Points and Planes

3/3 points (graded)

Let  $P_0=(1,2,5)$  and  $P_1=(-2,1,6)$ . Let  $P\left(t
ight)$  be the position of a moving point that goes from  $P_0$  to  $P_1$  at constant speed, with  $P\left(0\right)=P_{0}$  and  $P\left(1\right)=P_{1}$ . Find equations for the position  $P\left(t\right)=\left(x\left(t\right),y\left(t\right),z\left(t\right)\right)$ of this moving point.

$$x\left(t
ight)=oxed{1-3*t}$$

✓ Answer: -3\*t+1

$$y(t) =$$
 2-t

✓ Answer: -t+2

$$z(t) =$$
 5+t

**✓ Answer:** t+5

? INPUT HELP

#### **Solution:**

The desired trajectory may be written as a vector as:

$$\vec{P}(t) = P_0 + t \overrightarrow{P_0 P_1} \tag{6.87}$$

We can compute 
$$\overrightarrow{P_0P_1}=egin{pmatrix} -3 \ -1 \ 1 \end{pmatrix}$$
 . Therefore we have

$$\begin{pmatrix} x(t) \\ y(t) \\ z(t) \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} + t \begin{pmatrix} -3 \\ -1 \\ 1 \end{pmatrix}$$
(6.88)

Thus,

$$\begin{pmatrix} x(t) \\ y(t) \\ z(t) \end{pmatrix} = \begin{pmatrix} 1 - 3t \\ 2 - t \\ 5 + t \end{pmatrix}$$
(6.89)

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You have used 1 of 5 attempts

**1** Answers are displayed within the problem

#### Line and Plane

1/1 point (graded)

Let  $P_0=(1,2,5)$  and  $P_1=(-2,1,6)$ , and consider the plane given by -x-3y+z=12. Let P(t) be the position of a moving point that goes from  $P_0$  to  $P_1$  at constant speed, with  $P(0)=P_0$  and  $P(1)=P_1$ .

For what value of t does P(t) enter the plane?

#### Solution:

We need to solve the equation -x(t) - 3y(t) + z(t) = 12. If we substitute the values for x(t), y(t), z(t) found in the previous problem, we have the equation:

$$-(1-3t)-3(2-t)+(t+5) = 12 (6.90)$$

$$7t - 2 = 12 (6.91)$$

$$7t = 14$$
 (6.92)

Thus we obtain t=2.

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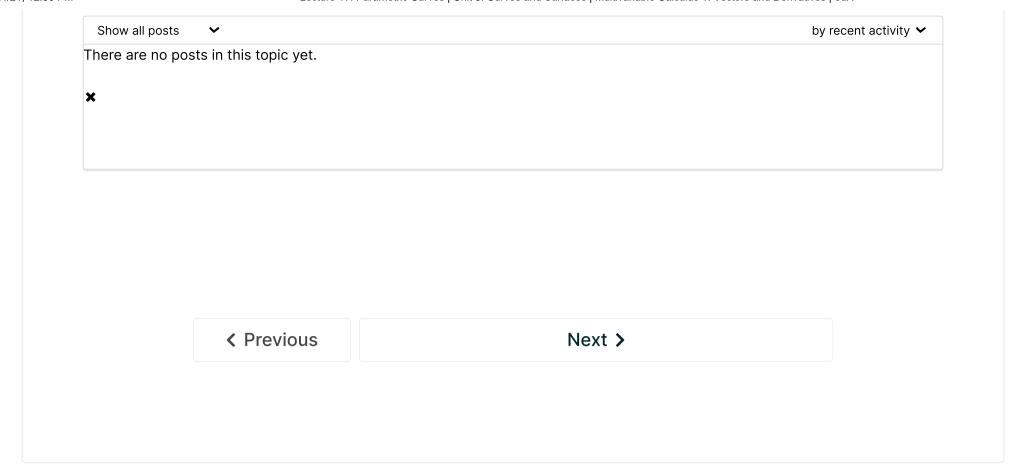
You have used 1 of 3 attempts

**1** Answers are displayed within the problem

#### 9. Practice Points in 3D

Topic: Unit 5: Curves and Surfaces / 9. Practice Points in 3D

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