Math 273 – Written Homework #1

Remember to show work or explanation on everything. Writing the answer only will not be accepted. Homework should be submitted on Crowdmark by the due date. Late work is not accepted. You will lose 1% for every minute your assignment is submitted after the deadline.

Your work should be unique! You may work together but identical work will receive a zero for the first assignment and then will be reported to the Student Board of Conduct.

No Written Homeworks may be uploaded to Chegg or similar websites. Anyone found uploading homework sets to a tutoring webpage will be given a zero and possibly fail the course.

---

1. Find an equation of the line of intersection of the planes:

Q: $4x + 2y - z = 1$

R: $3x - y + 4z = 2$

Let $z=0$:

Q: $4x + 2y = 1$

R: $2(3x - y = 2) +$

$10x = 5 \Rightarrow x = 1/2$

$3(\frac{1}{2}) - y = 2$

$-y = 1/2 \Rightarrow y = -1/2$

$P_0\left(\frac{1}{2}, -\frac{1}{2}, 0\right)$

$\vec{v} = \langle 4, 2, -1 \rangle \times \langle 3, -1, 4 \rangle = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 4 & 2 & -1 \\ 3 & -1 & 4 \end{vmatrix}$

$= 7\vec{i} - 19\vec{j} - 10\vec{k}$

$\vec{r}(t) = t\langle 7, -19, -10 \rangle + \langle \frac{1}{2}, -\frac{1}{2}, 0 \rangle$

2. Given the following equations for lines answer the following questions.

$$\boldsymbol{s}(t) = \langle t + 2, 5t, 2t - 3 \rangle$$

$$\boldsymbol{p}(t) = \langle 2, 3t - 3, 4t - 7 \rangle$$

a. What is one point that is contained on both $\boldsymbol{s}(t)$ and $\boldsymbol{p}(t)$?

b. Find an equation of the plane that contains both lines and the coordinate point found in part a.

c. If the point used in the calculations for part b was a different point on line $\boldsymbol{p}$, instead of the one found in part a, would the equation equal the same plane? Why or why not? Explain in your own words.

a.) $t+2=2 \rightarrow t=0$

$s(0)=\langle 2,0,-3\rangle$

$p(1)=\langle 2,0,-3\rangle$

$\Rightarrow$ our point is $(2,0,-3)$

b. $\vec{n}=\langle 1,5,2\rangle \times \langle 0,3,4\rangle = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 5 & 2 \\ 0 & 3 & 4 \end{vmatrix}$

$= 14\vec{i} - 4\vec{j} + 3\vec{k}$

Plane: $14(x-2)-4y+3(z+3)=0$

c. Yes, because any point on $\vec{p}(t)$ would be contained in the plane and thus be usable as P_0 for the plane equation.

3. **In your own words**, briefly explain at least two key differences in a line and a plane. (Do not just copy something from the definitions!)

Planes

- 3D
- multivariable (x, y, z)
- not a vector
- Equation uses a normal vector and a point.

Lines:

- 2D Path through 3D space
- 1 independent variable (t)
- a vector equation
- Equation uses a direction vector and a point