Math 233 - Assignment 3

Name _____

February 1, 2024

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due February 8.

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1. Find an equation of the plane that passes through the points $P\,(1,1,-1)$, $Q\,(2,0,2)$, and $R\,(0,-2,1)$.

2. Find an equation of the plane that passes through the point $(1,-1,3)$ and is parallel to the plane $3x+y+z=7$.

3. Find the coordinates of the point P at which the line

$$\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z}{3}$$

   intersects the plane $3x+2y-z=5$.

4. Find the measure of the angle between the planes $-x-2y+2z=5$ and $5x-2y-z=0$. Write your final answer in degrees rounded to the nearest hundredth.

5. Find parametric equations for the line of intersection of the two planes $-x-2y+2z=5$ and $5x-2y-z=0$.

6. Find an equation of the plane that passes through $P\,(1,2,3)$ and $Q\,(3,2,1)$ and is perpendicular to the plane $4x-y+2z=7$. (This problem might be challenging. For a possible solution, let $R\,(x,y,z)$ be any point in the plane containing P and Q. Then $\vec{PR}\times\vec{QR}$ is orthogonal to the normal vector of the given plane.)

7. Show that the planes are parallel. Then find the distance between them.

$$2x-6y+8z=5$$

$$-x+3y-4z=10$$

8. Find the distance from the point $P\,(8,-3,2)$ to the line

$$\frac{x-5}{2}=y-4=\frac{z}{7}.$$

9. Describe, in detail, the graph of the vector-valued function $\vec{r}(t)=(3t+7)\,\hat{\imath}+6t\,\hat{\jmath}-(5-t)\,\hat{k}$. Then compute the vector $\hat{T}(t)=\vec{r}\,'(t)/\|\vec{r}\,'(t)\|$.

10. Consider the vector-valued function $\vec{r}(t)=2t^2\,\hat{\imath}+(1+3t)\,\hat{\jmath}$. Determine an equation in the rectangular coordinates x and y that has the same graph as that of $\vec{r}(t)$.