

Math 233 - Assignment 3

February 6, 2025

Name _____

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due February 13.

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 $\vec{r}(t) = (3t + 7)\hat{i} + 6t\hat{j} - (5 - t)\hat{k}$. Then compute the vector $\hat{T}(t) = \vec{r}'(t)/\|\vec{r}'(t)\|$.
10. Consider the vector-valued function $\vec{r}(t) = 2t^2\hat{i} + (1 + 3t)\hat{j}$. Determine an equation in the rectangular coordinates x and y that has the same graph as that of $\vec{r}(t)$.