Chapter 9 Review Extra Practice

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1. Determine the point of intersection between the following pairs of lines:

a. L_1: $\vec{r} = (4, -4, 2) + s(2, 5, -6)$, $s \in \mathbf{R}$,
L_2: $\vec{r} = (2, 6, 2) + t(4, -5, -6)$ $t \in \mathbf{R}$

b. L_1: $\vec{r} = (-1, 5, -8) + s(-4, 8, 2)$, $s \in \mathbf{R}$,
L_2: $\vec{r} = (7, -1, 6) + t(6, -2, 3)$, $t \in \mathbf{R}$

c. L_1: $\vec{r} = (-2, 5, 0) + s(0, -6, -9)$, $s \in \mathbf{R}$,
L_2: $\vec{r} = (8, -1, -4) + t(-1, 1, 1)$, $t \in \mathbf{R}$

d. L_1: $\vec{r} = (3, 3, -8) + s(-3, -1, 6)$, $s \in \mathbf{R}$,
L_2: $\vec{r} = (3, 2, -6) + t(3, -4, 4)$, $t \in \mathbf{R}$

2. Solve the following systems of equations using elementary operations:

a. ① $x + y + z = 9$
② $x - y = 2$
③ $y - z = -4$

b. ① $3x + 4y + z = 9$
② $x + y + z = 2$
③ $x - y + z = 6$

c. ① $x + y = 8$
② $y + z = 2$
③ $x + y = 6$

d. ① $x + y = 6$
② $y + z = -6$
③ $x + z = 4$

3. In the following systems of equations involving two planes, determine the nature of their intersections. That is, state whether they intersect, and if they do intersect, specify if their intersection is a line or a plane.

a. ① $3x + 9y + 6z = 12$
② $2x + 6y + 4z = 8$

b. ① $3x + 4y + 5z - 6 = 0$
② $2x - 3y + 4z + 5 = 0$

c. ① $8x + 3y + 9z = 4$
② $2x - 6y + 5z = -8$

d. ① $6x + 5y - 3z + 6 = 0$
② $5x - y - 6z - 4 = 0$

4. Calculate the distance between the point P and the given line.

a. $P(-2, 4, -4)$ and $\vec{r} = (3, 3, 1) + s(4, -6, 6)$, $s \in \mathbf{R}$

b. $P(-4, 0, -2)$ and $\vec{r} = (5, 2, 2) + t(3, -2, -2)$, $t \in \mathbf{R}$

c. $P(1, 1, 1)$ and $\vec{r} = (6, 1, 3) + s(7, -8, -3)$, $s \in \mathbf{R}$

d. $P(0, -2, 6)$ and $\vec{r} = (8, -7, -2) + t(9, 4, -7)$, $t \in \mathbf{R}$

5. Calculate the distance between the following pairs of parallel lines:

a. $\vec{r} = (6, 4, 6) + s(3, 4, -9)$, $s \in \mathbf{R}$, and
$\vec{r} = (7, -5, 6) + t(3, 4, -9)$, $t \in \mathbf{R}$

b. $\vec{r} = (-2, 9, -2) + s(6, -7, 3)$, $s \in \mathbf{R}$, and
$\vec{r} = (6, 7, -4) + t(6, -7, 3)$, $t \in \mathbf{R}$

c. $\vec{r} = (3, -3, 8) + s(-4, -2, 4)$, $s \in \mathbf{R}$, and
$\vec{r} = (9, -9, -2) + t(-4, -2, 4)$, $t \in \mathbf{R}$

d. $\vec{r} = (-6, -6, -3) + s(1, 7, -7)$, $s \in \mathbf{R}$, and
$\vec{r} = (-4, -7, 7) + t(1, 7, -7)$, $t \in \mathbf{R}$

6. Determine the following:

a. the distance from $P(7, 0, 2)$ to the plane with equation $9x - 7y - 8z + 7 = 0$.

b. the distance from $P(8, -2, -3)$ to the plane with equation $3x + 7y - 3z - 5 = 0$.

c. the distance from $P(-1, -2, 7)$ to the plane with equation $6x - 5y - 6z + 3 = 0$.

d. the distance from $P(5, 9, 0)$ to the plane with equation $4x - 4y - 8z + 2 = 0$.

7. Determine the distance between the lines $\vec{r} = (2, 0, 9) + s(-5, 1, -5)$, $s \in \mathbf{R}$, and $\vec{r} = (0, 3, 4) + t(1, -6, -8)$, $t \in \mathbf{R}$.

8. Determine the distance between the lines $\vec{r} = (0, 6, -5) + s(1, 8, 5)$, $s \in \mathbf{R}$, and $\vec{r} = (-9, 1, 4) + t(-6, 2, -6)$, $t \in \mathbf{R}$.