Chapter 8 Review Extra Practice

STUDENT BOOK PAGES 480–483

1. a. Determine the vector, parametric, and symmetric equations (if possible) for the line passing through the points $A(0, 2, 3)$ and $B(3, -1, 3)$.
   b. Determine the vector and parametric equations for the plane containing the points $A(0, 2, 3)$, $B(3, -1, 3)$, and $C(2, 0, 1)$.

2. Determine the Cartesian equation of the plane passing through the point $P(2, -1, 2)$ and containing the line $\vec{r} = (2, -1, 4) + t(0, 3, -5)$, $t \in \mathbf{R}$.

3. Find the vector and parametric equations for the plane parallel to the *xy*-plane and passing through the point $Q(2, 3, 3)$.

4. A plane has Cartesian equation $4x - 3y + 6z - 12 = 0$.
   a. Determine vector and parametric equations for this plane.
   b. Determine the equation of a line that lies in the plane.
   c. Determine the equation of a plane that is perpendicular to the first plane and contains the line in 4.b.

5. Write a brief explanation of the plane represented by the equation $2x - z = 0$.

6. Sketch the following planes:
   a. π_1: $2x + 3y + 6z - 12 = 0$
   b. π_2: $2x + 3y - 12 = 0$
   c. π_3: $3y - 12 = 0$

7. A line is defined by the parametric equations $x = -1 + 3t$, $y = 2 + 4t$, $z = 2t$, $t \in \mathbf{R}$. If the point $(a, 0, b)$ lies on the line, determine a and b.

8. Two lines L_1 and L_2 are defined by the vector equations L_1: $\vec{r} = (1, -1, 1) + t(0, 3, -5)$, $t \in \mathbf{R}$ and L_2: $\vec{r} = (1, 2, -4) + t(0, 5, 3)$, $t \in \mathbf{R}$.
   a. Do L_1 and L_2 intersect?
   b. Are L_1 and L_2 perpendicular?
   c. Determine the vector and parametric equations of a plane that contains both L_1 and L_2.

9. Calculate the angle formed by the intersection of the lines L_1: $\vec{r} = (1, 0, 3) + t(1, 2, -5)$, $t \in \mathbf{R}$ and L_2: $\vec{r} = (1, 0, 3) + t(1, 3, 3)$, $t \in \mathbf{R}$.

10. Which of the following lines is parallel to the plane $2x - y + 5z - 13 = 0$?
    a. $\vec{r} = (2, -1, 4) + t(0, 5, 1)$, $t \in \mathbf{R}$
    b. $x = -1 + 3t$, $y = 2 + 11t$, $z = t$, $t \in \mathbf{R}$
    c. $\frac{x - 2}{3} = \frac{y + 1}{-2} = \frac{z}{4}$

11. Does the origin lie in the plane $\vec{r} = (2, -1, 4) + s(1, -2, 3) + t(0, 5, 1)$, $s, t \in \mathbf{R}$?

12. a. Determine the Cartesian equation for the plane that has normal vector $(3, 1, -5)$ and passes through the point $A(0, 1, -1)$.
    b. Determine the Cartesian equation for the plane parallel to the above plane that passes through the origin.

13. Determine the point of intersection of the lines L_1: $x = 2 + 3t$, $y = 3t$, $t \in \mathbf{R}$ and L_2: $x = 3s$, $y = 3 - 2s$, $s \in \mathbf{R}$.

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