MA 213 Worksheet #5

Section 12.5

1 (a) *12.5.3* Find the vector equation and the parametric equation of the line through the point $(2, 2.4, 3.5)$ and parallel to the vector $3\mathbf{i} - 2\mathbf{j} - \mathbf{k}$.

(b) *12.5.9* Find parametric equations and symmetric equations for the line through the points $(-8, 1, 4)$ and $(3, -2, 4)$.

2 *12.5.31* Find an equation of the plane through points $(0, 1, 1), (1, 0, 1)$, and $(1, 1, 0)$.

3 *12.5.19* Determine whether the lines

$$L_1 : x = 3 + 2t, y = 4 - t, z = 1 + 3t$$
$$L_2 : x = 1 + 4s, y = 3 - 2s, z = 4 + 5s$$

are parallel, skew, or intersecting. If they intersect, find the point of intersection.

4 *12.5.30* Find an equation of the plane that contains the line $\langle x, y, z\rangle = \langle 1 + t, 2 - t, 4 - 3t\rangle$ and is parallel to the plane $5x + 2y + z = 1$.

5 *12.5.48* Where does the line through $(-3, 1, 0)$ and $(-1, 5, 6)$ intersect the plane $2x+y-z = -2$?

6 *12.5.53* Determine whether the planes $x + 2y - z = 2$ and $2x - 2y + z = 1$ are parallel, perpendicular, or neither. If neither, find the angle between them.

Additional Recommended Problems

7 *12.5.1* Determine whether each statement is true or false in 3D space. If true, explain why. If false, give a counterexample.

(a) Two lines parallel to a plane are parallel.

(b) Two planes perpendicular to a third plane are parallel.

(c) Two planes parallel to a third plane are parallel.

(d) Two lines perpendicular to a plane are parallel.

8 *12.5.21* Determine whether the lines

$$L_1 : \frac{x-2}{1} = \frac{y-3}{-2} = \frac{z-1}{-3} \quad \text{and} \quad L_2 : \frac{x-3}{1} = \frac{y+4}{3} = \frac{z-2}{-7}$$

are parallel, skew, or intersecting. If they intersect, find the point of intersection.

9 *12.5.49* Find direction numbers for the line of intersection of the planes $x + y + z = 1$ and $x + z = 0$.

10 *12.5.61* Find an equation of the plane consisting of all the points that are equidistant from the points $(1, 0, -2)$ and $(3, 4, 0)$.

11 Assume that three points P, Q, and R are not collinear. Explain why the distance d between P and the line through Q and R is given by $d = \dfrac{\|\overrightarrow{QR} \times \overrightarrow{QP}\|}{\|\overrightarrow{QR}\|}$.