Assignment 2

Due on 2020-10-14, 23:59 ET.

Problem 1: Find an equation for the line in the plane.

a) The line passes through the points (2, 3, 1) and (4, 5, 3).

b) The line is parallel to the plane 2x + 3y - 4z = 5.

Problem 2: Find the equation of the plane.

a) The plane contains the points (1, 2, 3), (4, 5, 6), and (7, 8, 9).

b) The plane is parallel to the plane 2x + 3y - 4z = 5 and passes through the point (1, 2, 3).

Problem 3: Find the angle between the following vectors.

a) \( \vec{u} = \langle 2, 3, 4 \rangle \) and \( \vec{v} = \langle 1, -2, 3 \rangle \)

b) \( \vec{w} = \langle 1, 0, -1 \rangle \) and \( \vec{x} = \langle 2, 2, 2 \rangle \)

Problem 4: Find the area of the parallelogram with vertices at (1, 2, 3), (4, 5, 6), (7, 8, 9), and (10, 11, 12).

Problem 5: Find the volume of the pyramid with base \( \frac{1}{2} \) the area of the parallelogram in Problem 4 and height 3.

Problem 6: Find the vector \( \vec{a} \) parallel to \( \vec{b} \) such that \( \| \vec{a} \| = 3 \) and \( \vec{b} = \langle 1, 2, 3 \rangle \).

Problem 7: Find the vector projection of \( \vec{u} = \langle 2, 3, 4 \rangle \) onto \( \vec{v} = \langle 1, -2, 3 \rangle \).

Problem 8: Find the projection of \( \vec{u} = \langle 2, 3, 4 \rangle \) onto the line \( \vec{d} = \langle 1, 0, 1 \rangle \).

Problem 9: Find the distance between the points (1, 2, 3) and (4, 5, 6).

Problem 10: Find the coordinates of the point that is \( \frac{1}{2} \) the way from (1, 2, 3) to (4, 5, 6).

Problem 11: Find the equation of the plane that passes through the points (1, 2, 3), (4, 5, 6), and (7, 8, 9).

Problem 12: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is parallel to the plane \( 2x + 3y - 4z = 5 \).

Problem 13: Find the equation of the plane that is perpendicular to the plane \( 2x + 3y - 4z = 5 \) and passes through the point (1, 2, 3).

Problem 14: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is parallel to the line \( \vec{s}(t) = \langle 5 + t, 6 + 2t, 7 + 3t \rangle \).

Problem 15: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is perpendicular to the plane \( 2x + 3y - 4z = 5 \).

Problem 16: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is parallel to the plane \( 2x + 3y - 4z = 5 \) and contains the point (1, 2, 3).

Problem 17: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is perpendicular to the plane \( 2x + 3y - 4z = 5 \) and contains the point (1, 2, 3).

Problem 18: Find the equation of the plane that contains the line \( \vec{r}(t) = \langle 1 + 2t, 3 - t, 4 + 3t \rangle \) and is parallel to the plane \( 2x + 3y - 4z = 5 \) and contains the point (1, 2, 3).