

1.) Find an equation in parametric form of the line

a.) in R^2 passing through the point $(2, -1)$ and parallel to the vector $\begin{pmatrix} 3 \\ 5 \end{pmatrix}$.

b.) in R^2 passing through the point $(3, 2)$ and perpendicular to the vector $\begin{pmatrix} -1 \\ -1 \end{pmatrix}$.

c.) in R^2 passing through the points $(4, 0)$ and $(-1, 3)$.

d.) in R^3 passing through the point $(0, 2, 1)$ and parallel to the vector $\begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}$.

e.) in R^3 passing through the points $(1, 2, 3)$ and $(4, 5, 6)$.

2.) Determine an equation for the plane passing through the point $(-1, 0, 4)$ and which is perpendicular to the vector $\begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$.

3.) Determine a point on the plane $x + 2y + 3z = 12$ and a vector which is perpendicular to it.

4.) Determine an equation of the plane which is parallel to the plane $3x - 2y + z = 0$ and which passes through the point $(1, -1, 0)$.

5.) Determine an equation of the plane which passes through the point $(1, -1, 0)$ and which is perpendicular to the line given parametrically by $L : \begin{cases} x = 3 + 2t \\ y = -1 - t \\ z = 2 + t \end{cases}$.

6.) Determine an equation of the line in parametric form which passes through the point $(2, -3, 1)$ and which is perpendicular to the plane $3x - y + z = 5$.

7.) Find three points which lie on both of the planes $x - y + z = 1$ and $2x + y - z = 3$.

8.) Determine an equation of the line in parametric form which represents the intersection of the planes $x - y + z = 2$ and $3x + y - 4z = 1$.

9.) Determine the point of intersection of the plane $x - y + 2z = 4$ and the line given parametrically by $L : \begin{cases} x = t \\ y = 1 - t \\ z = 1 + 2t \end{cases}$.

10.) The following lines intersect. Determine their point of intersection :

$$L : \begin{cases} x = 1 + t \\ y = 2t \\ z = -1 + t \end{cases} \quad \text{and} \quad M : \begin{cases} x = s \\ y = 2 + s \\ z = -2 + s \end{cases} .$$

11.) Determine the angle θ between the vectors $\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$.

12.) Determine the angle θ between the vector $\begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$ and the line given parametrically by

$$L: \begin{cases} x = 3t \\ y = 1 + t \\ z = 1 - 2t \end{cases} .$$

13.) Determine the angle θ between the planes $z = 2x - y$ and $x + 2y + 3z = 6$.

14.) Find the point of intersection of the plane $3x - 2y + z = 24$ and the line passing through the point $(2, -1, 3)$ which meets the plane orthogonally.

“ ..., because this is America.” – Kouba