

Homework/ Vectors, equations of lines and planes

Q1/ Consider the lines:

$$x = 1 + c \qquad x = 2s$$

$$x = \frac{3}{2} + 3c \qquad x = 1 + s$$

$$x = -c \qquad x = -2 + 4s$$

Are the lines parallel? Do they intersect?

Q2/ Does the point $P = (1, 2, 3)$ belong to the plane containing $P_0 = (3, 1, 2)$ and perpendicular to $n = i+j+k$?

Q3/ Find the intersection, if any, of the line:

$$x = 2 + 3c, \quad y = -4c, \quad z = 5 + c$$

and the plane:

$$4x + 5y - 2z = 18$$

Q4/ Write the equation of a plane which:

(a) Passes through the point $M (-2, 3, 4)$ and is parallel with the vectors:

$$\vec{v}_1 = i - 2j + k$$

$$\vec{v}_2 = 3i + 2j + 4k$$

(b) Passes through the point $M (1, -1, 1)$ and is perpendicular on the planes:

$$x - y + z - 1 = 0$$

$$2x + y + z + 1 = 0$$

Q5/ Find the vector, parametric and symmetric equations of the line through $(-3, 1, 0)$ and perpendicular to both

$$\vec{v}_1 = -3\mathbf{j} + \mathbf{k} \quad \text{and}$$

$$\vec{v}_2 = 4\mathbf{i} + 2\mathbf{j} - \mathbf{k}$$

Q6/ Let the points $A=(2, 3, -1)$, $B=(-1, 0, 1)$ and $C=(-3, 0, 1)$. Find: 1- Parametric equations for the line containing A and B. 2- Area of a triangle ABC. 3- An equation for the plane containing A, B, and C.

Q7/ Given the points $P=(-3, 0, 2)$, $Q=(1, -2, 1)$ and $R=(2, 2, -5)$

- 1- Find the angle between \vec{QP} and \vec{QR} .
- 2- Find the vector projection of \vec{PR} in the direction of \vec{PQ} .
- 3- Find parametric equations for the line containing P and Q.
- 4- Find the area of a triangle PQR.
- 5- Find an equation for the plane containing P, Q, and R.

Q8/ You are given lines L_1 and L_2 with equations:

$$L_1 = \frac{x - x_0}{2} = \frac{y - y_0}{3} = z_0 - z$$

$$L_2 = \frac{x - x_0}{2} = \frac{y_0 - y}{3} = \frac{z - z_0}{2}$$

Compute the acute angle between the lines L_1 and L_2 , correct to the nearest degree.