

Homework/ Vectors, equations of lines and planes

Q1/ Show that the line through the points $(0,1,1)$ and $(1,-1,6)$ is perpendicular to the line through the points $(-4,2,1)$ and $(-1,6,2)$.

Q2/ Find an equation of the plane that passes through the points $(1,-2,-1)$ and $(2, 5, 6)$ and is parallel to the x-axis.

Q3/ Find an equation of the plane that contains the point $(4,-1, 3)$ and is perpendicular to the vector $\mathbf{n}=2\mathbf{i}+8\mathbf{j}-5\mathbf{k}$

Q4/ Find the equation of the plane containing the point $(1, 3,-1)$ and perpendicular to the planes $\mathbf{x}+\mathbf{y}-2\mathbf{z}=1$ and $2\mathbf{x}+\mathbf{y}+\mathbf{z}=2$.

Q5/ Find an equation of the plane containing the point $(0, 1, 1)$ and perpendicular to the line passing through the points $(2, 1, 0)$ and $(1, -1, 0)$. Also find the area of the triangle.

Q6/ Given the points $\mathbf{P}=(0, 1, 0)$, $\mathbf{Q}=(-1,1, 2)$ and $\mathbf{R}=(2, 1,-1)$

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

Q7/ Let \mathbf{L}_1 be the plane $(\mathbf{x} + 3\mathbf{y} + \mathbf{z} = 0)$ and \mathbf{L}_2 be the plane $(2\mathbf{x} + \mathbf{y} - \mathbf{z} = 1)$. Find:

- 1- The angle between the planes.
- 2- The parametric equations of the line of intersection between the two planes.
- 3- The distance from the plane \mathbf{L}_2 to the **origin**.

Q8/ given two lines:

$$L_1 \quad x = 1 + c$$

$$y = -2 + 3c$$

$$z = 4 - c$$

$$L_2 \quad x = 2s$$

$$y = 3 + s$$

$$z = -3 + 4s$$

1- Determine whether they intersect each other, or they are parallel, or neither (skew lines).

2- Find the distance from $\mathbf{P}_1(1, -2, 1)$ to the line \mathbf{L}_1 .