

## Unit 8 Assignment: Equations of Lines and Planes

**\*You must show at least one line of calculations for dot or cross products**

### Question 1 (4 marks)

Find a vector equation for:

- the plane that passes through the points  $A(0, 3, 2)$ ,  $B(1, 2, 1)$  and  $C(-1, 5, 2)$
- the plane that passes through the point  $P(2, 0, 1)$  and is parallel to the xy-plane

### Question 2 (4 marks)

Given the plane  $3x + 2y - 3z + 5 = 0$

- Determine if the point  $(5, -3, 4)$  is on the plane.
- Determine the value of 'z' so that the point  $(1, -3, z)$  is on the plane

### Question 3 (5 marks)

Find the scalar equation for the plane  $\pi$ : 
$$\begin{cases} x = 1 + s \\ y = 3 - 2s + t \\ z = 1 + 2t \end{cases}$$

### Question 4 (5 marks)

Determine the scalar equation of the plane perpendicular to the line  $[x, y, z] = [4, -1, 2] + t[4, 2, 5]$  and including the point  $(2, -3, 1)$

### Question 5 (1 mark)

Find any vector **parallel** to the plane defined by the equation  $3x - 2y + z - 5 = 0$ .

### Question 6 (1 mark)

Find any vector **perpendicular** to the plane defined by the equation  $3x - 2y + z - 5 = 0$ .

**Question 7 (7 marks)**

Find the point of intersection of  $l_1$  and  $l_2$  if possible.

$$\text{a) } l_1 : \begin{cases} x = -2 + 3s \\ y = 4 - 3s \\ z = -1 + s \end{cases} \text{ and } l_2 : \begin{cases} x = 7 + t \\ y = 10 + 4t \\ z = 4 + 3t \end{cases}$$

$$\text{b) } \begin{aligned} [x, y, z] &= [9, -1, 1] + s[-3, 4, 1] \\ [x, y, z] &= [-3, 11, 5] + t[6, -8, -2] \end{aligned}$$

**Question 8 (8 marks)**

Determine whether the following statements are true or false. Justify your answer.

- a) The equation of a line through the point A (4,8) with direction vector [1,2] could be expressed as  $[x,y] = [4,8] + s[4, 8]$
- b) P(13, -14) is on the line with vector equation  $[x, y] = [3, 11] + t [4,-10]$
- c) The following lines are actually the same line:  
L1:  $[x, y, z] = [3, 1, 0] + t[1, 8, 3]$ , and L2:  $[x, y, z] = [4, 9, 3] + s[2,16, 6]$
- d) The line  $[x,y] = [5,-1] + t[-9,-2]$  is parallel to the line  $[x,y] = [10, -2] + s[2, -9]$