

KNOWLEDGE	24
COMMUNICATION	Level

UNIT 8: LINES & PLANES - QUIZ #1

1. a.) Write a vector equation for the line through the points A(1, 4) and B(3, 1).
 b.) Determine two more position vectors to points on the line. Graph the line.
 c.) Determine if the point (2, 3) is on the line.

a.) $\vec{m} = \vec{OB} - \vec{OA}$ Choose one of points A or B to be the position vector, $\vec{r}_0 = [3, 1]$.
 $= [3, 1] - [1, 4]$
 $= [2, -3]$ ✓ Therefore, $[x, y] = [3, 1] + t[2, -3]$. ✓

b.) Let $t = 1, 2$
 $[x, y] = [3, 1] + (1)[2, -3]$
 $= [5, -2]$ ✓
 $[x, y] = [3, 1] + (2)[2, -3]$
 $= [7, -5]$ ✓

Out of
10 marks

c.) $[x, y] = [3, 1] + t[2, -3]$ becomes
 $[2, 3] = [3, 1] + t[2, -3]$

Equate the x-coordinates.

$2 = 3 + 2t$ ✓

$t = \frac{1}{2}$ ✓

Equate the y-coordinates.

$3 = 1 - 3t$ ✓

$t = \frac{2}{3}$ ✓

Since the t -values are not equal, the point (2, 3) does not lie on the line. ✓

2. A line passes through points A(2, -1, 5) and B(3, 6, -4).

- a) Write a vector equation of the line.
 b) Write parametric equations for the line.

a.) $\vec{m} = \vec{OB} - \vec{OA}$
 $= [3, 6, -4] - [2, -1, 5]$
 $= [1, 7, -9]$ ✓ Therefore, $[x, y, z] = [2, -1, 5] + t[1, 7, -9]$ ✓

b.) $x = 2 + t$
 $y = -1 + 7t$ ✓
 $z = 5 - 9t$

Out of
4 marks

3. Consider the plane defined by the scalar equation $x + 2y - z - 8 = 0$.
- Determine if the points $A(1, 3, -1)$, $B(3, 5, 1)$, and $C(1, 6, 5)$ are on the plane.
 - Determine the x -, y -, and z -intercepts of the plane.
 - Determine the coordinates of another point on the plane.
 - Write one vector that is parallel to the plane.

a.)

Check $A(1, 3, -1)$	Check $B(3, 5, 1)$	Check $C(1, 6, 5)$
$1S = (1) + 2(3) - (-1) - 8$	$1S = (3) + 2(5) - (1) - 8$	$1S = (1) + 2(6) - (5) - 8$
$= 0$	$= 4$	$= 0$
$= RS$	$\neq RS$	$= RS$

Points A and C are on the plane, but point B is not.

- b.)
- | | | |
|--|--|--|
| At the x -intercept, both the y - and z -coordinates equal zero. | At the y -intercept, both the x - and z -coordinates equal zero. | At the z -intercept, both the x - and y -coordinates equal zero. |
|--|--|--|

$x + 2(0) - (0) - 8 = 0$	$(0) + 2y - (0) - 8 = 0$	$(0) + 2(0) - z - 8 = 0$
$x = 8$	$y = 4$	$z = -8$

The x -intercept is 8. The y -intercept is 4. The z -intercept is -8.

- c.) Let $x = 1$ and $y = 1$.

$(1) + 2(1) - z - 8 = 0$
 $z = -5$

Therefore $(1, 1, -5)$ is a point on the plane.

Out of 10 marks

d.) $\vec{AC} = [1, 6, 5] - [1, 3, -1]$
 $= [0, 3, 6]$

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