20710-214	TUTTOETS 1 / TUT TEST 1	2023
Voorl's en Van / Init's and Surname:	MEMO	
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Beskou the lyn L en die punt ß.   Consider the line L and the point **q**

$$L: \quad \frac{x+1}{3} = \frac{2-y}{4} = \frac{z-1}{1}, \qquad \mathbf{q} = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}.$$

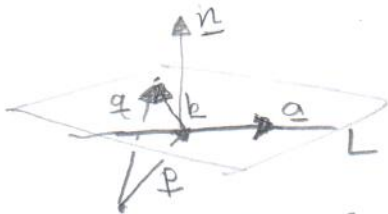1 Skryf die vektor-parametriese vorm van die lyn L neer ✓ ✓

Write down the vector parametric form of the line L.

$$\mathbf{r} = \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix} + t \begin{bmatrix} 3 \\ -4 \\ 1 \end{bmatrix}$$

$\frac{x+1}{3} = t \longrightarrow x = -1 + 3t$

$\frac{y-2}{-4} = t \longrightarrow y = 2 - 4t$

$\frac{z-1}{1} = t \longrightarrow z = 1 + t$

2 Vind die vergelyking van die vlak P wat die lyn L sowel as die punt **q** bevat.

Find the equation of the plane P that contains the line L as well as the point **q**.

$$\underline{p} = \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}, \quad \underline{q} = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}, \quad \underline{a} = \begin{bmatrix} 3 \\ -4 \\ 1 \end{bmatrix}$$

$$\underline{b} = \underline{q} - \underline{p} = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix} - \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} ✓$$

$$\underline{n} = \underline{a} \times \underline{b} = \begin{bmatrix} 3 \\ -4 \\ 1 \end{bmatrix} \times \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} -4-1 \\ 2-3 \\ 3-(-8) \end{bmatrix}$$

$$= \begin{bmatrix} -5 \\ -1 \\ 11 \end{bmatrix} ✓✓✓$$

Plane P: $\underline{n}^T \underline{r} = \underline{n}^T \underline{p}$

$$\begin{bmatrix} -5 & -1 & 11 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 & -1 & 11 \end{bmatrix} \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix} = 5 - 2 + 11 = 14$$

P: $\boxed{-5x - y + 11z = 14}$ ✓

3 Watter een van die vlakke hieronder is loodreg op die vlak P?

Which one of the planes below are perpendicular to the plane P?

(a) $x + y + 2z = 10$
(b) $x + 6y + z = 8$
(c) $5x - 5y + z = 1$
(d) $2x + y + 4z = 6$

(a) $\begin{bmatrix} -5 & -1 & 11 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} = 18 \neq 0$

(b) $\begin{bmatrix} -5 & -1 & 11 \end{bmatrix} \begin{bmatrix} 1 \\ 6 \\ 1 \end{bmatrix} = 0$ ← This one.

Answer: (b) ✓