S. 86

1)

$$g_1: \vec{x} = \begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix} + \alpha \begin{pmatrix} 0-1 \\ 7-3 \\ 4-2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix} + \alpha \begin{pmatrix} -1 \\ 4 \\ 2 \end{pmatrix}$$

$\nparallel$

$$g_2: \vec{x} = \begin{pmatrix} -10 \\ 8 \\ 6 \end{pmatrix} + \beta \begin{pmatrix} -7+10 \\ 9-8 \\ 6-6 \end{pmatrix} = \begin{pmatrix} -10 \\ 8 \\ 6 \end{pmatrix} + \beta \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$$

$$g_1 = g_2 \quad \left| \begin{array}{l} 1 - \alpha = -10 + 3\beta \\ 3 + 4\alpha = 8 + \beta \\ 2 + 2\alpha = 6 \end{array} \right|$$

$1 - 2 = -10 + 3\beta \rightarrow \beta = 3$

$3 + 8 = 8 + \beta \rightarrow \beta = 3$

$\alpha = 2$

Schnittpunkt: $g_1: \begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix} + 2 \cdot \begin{pmatrix} -1 \\ 4 \\ 2 \end{pmatrix} = \begin{pmatrix} -1 \\ 11 \\ 6 \end{pmatrix}$

$=$

$g_2: \begin{pmatrix} -10 \\ 8 \\ 6 \end{pmatrix} + 3 \cdot \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} -1 \\ 11 \\ 6 \end{pmatrix}$

3)

$$e: \vec{x} = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} + \alpha \begin{pmatrix} 3-1 \\ 1-2 \\ 2-5 \end{pmatrix} + \beta \begin{pmatrix} -2-1 \\ 4-2 \\ 1-5 \end{pmatrix}$$

$$\vec{x} = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} + \alpha \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix} + \beta \begin{pmatrix} -3 \\ 2 \\ -4 \end{pmatrix} = \begin{pmatrix} 3 \\ 8 \\ 3 \end{pmatrix} + \varepsilon \begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix}$$

$g = e$

$$\left| \begin{array}{l} 2\alpha - 3\beta - 2\varepsilon = 2 \\ -\alpha + 2\beta - \varepsilon = 6 \\ -3\alpha - 4\beta - 3\varepsilon = -2 \end{array} \right| \quad I \cdot 2 \quad I \cdot (-3)$$

$$x_2 = \begin{pmatrix} 3 \\ 8 \\ 3 \end{pmatrix} + \begin{pmatrix} -6 \\ -3 \\ -9 \end{pmatrix} = \begin{pmatrix} -3 \\ 5 \\ -6 \end{pmatrix}$$

$$\left| \begin{array}{l} -\alpha + 2\beta - \varepsilon = 6 \\ 0 \quad \beta - 4\varepsilon = 14 \\ 0 \quad -10\beta = -20 \end{array} \right| \quad \cancel{I \cdot (10)}$$

$\alpha = 1$

$\varepsilon = -3$

$\beta = 2$

$$\cancel{\left| \begin{array}{l} -\alpha + 2\beta - \varepsilon = 6 \\ 0 \quad \beta - 4\varepsilon = 14 \\ 0 \quad 0 \quad -34\varepsilon = 68 \end{array} \right|}$$

$$x_1 = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix} + \begin{pmatrix} -6 \\ 4 \\ -8 \end{pmatrix} = \begin{pmatrix} -3 \\ 5 \\ -6 \end{pmatrix}$$

4) $e_1: \vec{n} = \begin{pmatrix} -4 \\ 2 \\ 1 \end{pmatrix} \times \begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix} = \begin{pmatrix} -4 \\ -5 \\ -6 \end{pmatrix}$

$e_2: \vec{n} = \begin{pmatrix} 10 \\ 8 \\ 0 \end{pmatrix} \times \begin{pmatrix} 1 \\ 4 \\ -4 \end{pmatrix} = \begin{pmatrix} -32 \\ 40 \\ 32 \end{pmatrix}$

$e_1: \quad -4 \cdot 1 + (-5) \cdot 2 + (-6) \cdot (-3) = -4 - 10 - 18 = -32$

$4x + 5y + 6z = 32$

$e_2: \quad -32 \cdot 2 + 40 \cdot 4 + 32 \cdot (-4) = -64 + 160 - 128 = -32$

$-32x + 40y + 32z = -32 \underset{:8}{\Leftrightarrow} -4x + 5y + 4z = -4$

$\vec{n}_1 \begin{pmatrix}4\\5\\6\end{pmatrix}$ $\vec{n}_2 \begin{pmatrix}-4\\5\\4\end{pmatrix}$ $g: \vec{x} = \begin{pmatrix}4{,}5\\2{,}8\\0\end{pmatrix} + \delta \begin{pmatrix}1\\4\\4\end{pmatrix}$

linear unabhängig

$$R_g : \begin{pmatrix}4\\5\\6\end{pmatrix} \times \begin{pmatrix}-4\\5\\4\end{pmatrix} = \begin{pmatrix}-10\\-40\\-40\end{pmatrix} \to \begin{pmatrix}1\\4\\4\end{pmatrix}$$

$$\left| \begin{array}{l} 4x + 5y + 6z = 32 \\ -4x + 5y + 4z = -4 \end{array} \right| \qquad z = 0$$

$$\left| \begin{array}{l} 4x + 5y = 32 \\ -4x + 5y = -4 \end{array} \right| \; \text{I} + \text{II}: \quad 10y = 28 \qquad y = 2{,}8$$

$$4x + 14 = 32$$
$$4x = 18 \qquad x = \tfrac{9}{2} = 4{,}5$$