S. 135/4

Koordinatenebenen

$E_{12}: \vec{x} = \lambda \begin{pmatrix}1\\0\\0\end{pmatrix} + \mu \cdot \begin{pmatrix}0\\1\\0\end{pmatrix}$ bzw. $E_{12}: x_3 = 0$

$E_{13}: \vec{x} = \lambda \begin{pmatrix}1\\0\\0\end{pmatrix} + \mu \begin{pmatrix}0\\0\\1\end{pmatrix}$ bzw. $E_{13}: x_2 = 0$

$E_{23}: \vec{x} = \lambda \begin{pmatrix}0\\1\\0\end{pmatrix} + \mu \begin{pmatrix}0\\0\\1\end{pmatrix}$ bzw. $E_{23}: x_1 = 0$

b) $g: \vec{x} = \begin{pmatrix}3\\2\\1\end{pmatrix} + \lambda \begin{pmatrix}-1\\2\\0\end{pmatrix}$

$g \cap E_{12}: \quad 1 + 0 \cdot \lambda = 0$ ↯ kein SP $g \parallel E_{12}$

$g \cap E_{13}: \quad 2 + 2\lambda = 0 \Rightarrow \lambda = -1$

$\begin{pmatrix}3\\2\\1\end{pmatrix} - \begin{pmatrix}-1\\2\\0\end{pmatrix} = \begin{pmatrix}4\\0\\1\end{pmatrix} \Rightarrow S_{13}(4|0|1)$

$g \cap E_{23}: \quad 3 - \lambda = 0 \Rightarrow \lambda = 3$

$\begin{pmatrix}3\\2\\1\end{pmatrix} + 3\begin{pmatrix}-1\\2\\0\end{pmatrix} = \begin{pmatrix}0\\8\\1\end{pmatrix} \Rightarrow S_{23}(0|8|1)$

S. 135/5

Koordinatenachsen

x_1-Achse: $\vec{x} = \lambda \cdot \begin{pmatrix}1\\0\\0\end{pmatrix}$

x_2-Achse: $\vec{x} = \lambda \cdot \begin{pmatrix}0\\1\\0\end{pmatrix}$

x_3-Achse: $\vec{x} = \lambda \cdot \begin{pmatrix}0\\0\\1\end{pmatrix}$

a) $E: \vec{x} = \begin{pmatrix}3\\0\\2\end{pmatrix} + \mu \cdot \begin{pmatrix}2\\1\\2\end{pmatrix} + \gamma \begin{pmatrix}2\\-2\\1\end{pmatrix}$

langwierig, aber möglich:
gleichsetzen von Gerade und Ebene

x_1-Achse: $\lambda \begin{pmatrix}1\\0\\0\end{pmatrix} = \begin{pmatrix}3\\0\\2\end{pmatrix} + \mu \begin{pmatrix}2\\1\\2\end{pmatrix} + \gamma \begin{pmatrix}2\\-2\\1\end{pmatrix}$

II) $0 = \mu - 2\gamma \Rightarrow \mu = 2\gamma$

III) $0 = 2 + 2\mu + \gamma$ in III: $-2 = 4\gamma + \gamma \Rightarrow \gamma = -\frac{2}{5}$

$\Rightarrow \mu = -\frac{4}{5}$

in I) $\lambda = 3 - \frac{4}{5} \cdot 2 - \frac{2}{5} \cdot 2 = \frac{15}{5} - \frac{12}{5} = \frac{3}{5}$

$\Rightarrow S_1(3/5|0|0)$

ebenso für x_2- und x_3-Achse

S. 135/5a

$E: \vec{x} = \begin{pmatrix}3\\0\\2\end{pmatrix} + \mu\begin{pmatrix}2\\1\\2\end{pmatrix} + \nu\begin{pmatrix}2\\-2\\1\end{pmatrix}$

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

$E: \begin{pmatrix}5\\2\\-6\end{pmatrix} \circ \left[\begin{pmatrix}x_1\\x_2\\x_3\end{pmatrix} - \begin{pmatrix}3\\0\\2\end{pmatrix}\right] = 0$

5b: $S_1(4|0|0)$, $S_2(0|-6|0)$, $S_3(0|0|3)$

$E: 5x_1 + 2x_2 - 6x_3 - 3 = 0$

5c: S_1 gibt es nicht! $S_2(0|6|0)$, $S_3(0|0|2)$ → $E \parallel x_1$-Achse!

x_1-Achse: $5\lambda - 3 = 0 \Rightarrow \lambda = \frac{3}{5}$ $S_1(3/5|0|0)$

x_2-Achse: $2\lambda - 3 = 0 \Rightarrow \lambda = \frac{3}{2}$ $S_2(0|\frac{3}{2}|0)$

x_3-Achse: $-6\lambda - 3 = 0 \Rightarrow \lambda = -\frac{1}{2}$ $S_3(0|0|-\frac{1}{2})$

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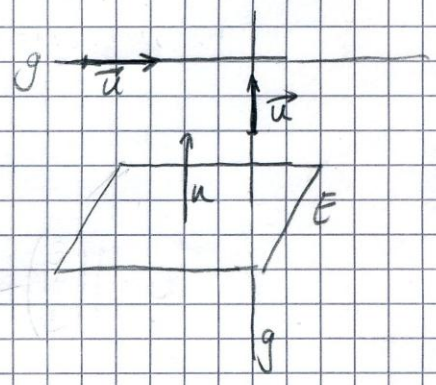
$E: \vec{x} = \begin{pmatrix}3\\1\\2\end{pmatrix} + \mu\begin{pmatrix}4\\3\\2\end{pmatrix} + \nu\begin{pmatrix}2\\1\\2\end{pmatrix}$



a) $g: \vec{x} = \begin{pmatrix}2\\1\\5\end{pmatrix} + \lambda\cdot\begin{pmatrix}2\\a\\-1\end{pmatrix}$

$\vec{n} = \begin{pmatrix}4\\3\\2\end{pmatrix} \times \begin{pmatrix}2\\1\\2\end{pmatrix} = \begin{pmatrix}4\\-4\\-2\end{pmatrix} = 2\cdot\begin{pmatrix}2\\-2\\-1\end{pmatrix}$

$g \perp E \Rightarrow \vec{u} = k\cdot\vec{n}$

$\begin{pmatrix}2\\a\\-1\end{pmatrix} = k\cdot\begin{pmatrix}2\\-2\\-1\end{pmatrix} \Rightarrow k = 1 \Rightarrow a = -2$

$g \parallel E \Rightarrow \vec{u} \perp \vec{n} \Rightarrow \vec{u} \circ \vec{n} = 0$

$\begin{pmatrix}2\\a\\-1\end{pmatrix} \circ \begin{pmatrix}2\\-2\\-1\end{pmatrix} = 4 - 2a + 1 = 0$

$5 = 2a$

$\Rightarrow a = 2{,}5$

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$g \in E: g: \vec{x} = \begin{pmatrix}1\\2\\1\end{pmatrix} + \lambda\begin{pmatrix}1\\1\\0\end{pmatrix}$ oder $u: \vec{x} = \begin{pmatrix}1\\2\\1\end{pmatrix} + \lambda\cdot\begin{pmatrix}1\\-2\\1\end{pmatrix}$

$g \parallel E: g: \vec{x} = \begin{pmatrix}1\\2\\3\end{pmatrix} + \lambda\begin{pmatrix}1\\1\\0\end{pmatrix}$