VG II, TBM 5A, 2.11.12

① $g: \begin{pmatrix} x \\ y \end{pmatrix} = \underbrace{\begin{pmatrix} -7 \\ 3 \end{pmatrix}}_{P_0(-7/3)} + s \underbrace{\begin{pmatrix} 7 \\ -1 \end{pmatrix}}_{\vec{g}}$

$\vec{g} = \begin{pmatrix} 7 \\ -1 \end{pmatrix} \Rightarrow \vec{n} = \begin{pmatrix} 1 \\ 7 \end{pmatrix}$

$\hookrightarrow \quad 1 \cdot x + 7 \cdot y + C = 0$

$P_0(-7/3)$ einsetzen:

$$1 \cdot (-7) + 7 \cdot 3 + C = 0$$

$$C = -14$$

$$\underline{\underline{x + 7y - 14 = 0}}$$

$$7y = -x + 14 \quad / : 7$$

$$\underline{\underline{y = -\frac{1}{7}x + 2}}$$

② $g: \quad 6x - 9y + 7 = 0 \qquad \vec{n}_g = \begin{pmatrix} 6 \\ -9 \end{pmatrix}$ resp. $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

$h: \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 5 \end{pmatrix} + s \underbrace{\begin{pmatrix} 3 \\ 2 \end{pmatrix}}_{\vec{h}} \qquad \vec{n}_h = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

$\vec{n}_g, \vec{n}_h$ sind kollinear $\Rightarrow$ parallel

③ $g: \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 5 \\ -2.5 \end{pmatrix} + s\begin{pmatrix} 2 \\ -4 \\ 3 \end{pmatrix}$

$P \in g$, d.h. es gibt ein s, sodass

$$\begin{pmatrix} 3 \\ 5 \\ -2.5 \end{pmatrix} + s\begin{pmatrix} 2 \\ -4 \\ 3 \end{pmatrix} = \begin{pmatrix} 10 \\ -9 \\ 8 \end{pmatrix}$$

$3 + 2s = 10$ $\quad$ $5 - 4s = -9$ $\quad$ $-2.5 + 3s = 8$

$s = 7/2$ $\quad$ $s = 7/2$ $\quad$ $s = 7/2$

$$\Rightarrow \underline{\underline{\begin{pmatrix} 3 \\ 5 \\ -2.5 \end{pmatrix} + \frac{7}{2}\begin{pmatrix} 2 \\ -4 \\ 3 \end{pmatrix} = \begin{pmatrix} 10 \\ -9 \\ 8 \end{pmatrix}}}$$

④ $\vec{x} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$; $\vec{v} = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$

Beide Vektoren liegen in xz-Ebene; die Senkrechte zu xz-Ebene ist parallel zu y-Achse!

$$\longleftrightarrow \quad \vec{w} = \begin{pmatrix} 0 \\ \pm 3 \\ 0 \end{pmatrix}$$

⑤ $$\underbrace{\begin{pmatrix} 2 \\ 7 \\ 3 \end{pmatrix}}_{a} + s\underbrace{\begin{pmatrix} 4 \\ 1 \\ 2 \end{pmatrix}}_{b} = \underbrace{\begin{pmatrix} -3 \\ 5 \\ 8 \end{pmatrix}}_{c} + t\underbrace{\begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix}}_{d}$$

TR: Solve(a + s·b = c + t·d, {s,t})

$s = -2$, $t = -3$

$$\vec{r}_P = \begin{pmatrix} 2 \\ 7 \\ 3 \end{pmatrix} - 2\begin{pmatrix} 4 \\ 1 \\ 2 \end{pmatrix} = \begin{pmatrix} -6 \\ 5 \\ -1 \end{pmatrix}; \quad P(-6/5/-1)$$

5 $S(-6/5/-1)$ $\qquad \vec b = \begin{pmatrix}4\\1\\2\end{pmatrix}$

$\vec d = \begin{pmatrix}1\\0\\3\end{pmatrix}$

$$\frac{\vec b \cdot \vec d}{b \cdot d} = \frac{10}{\sqrt{21}\cdot\sqrt{10}} = \frac{\sqrt{210}}{21}$$

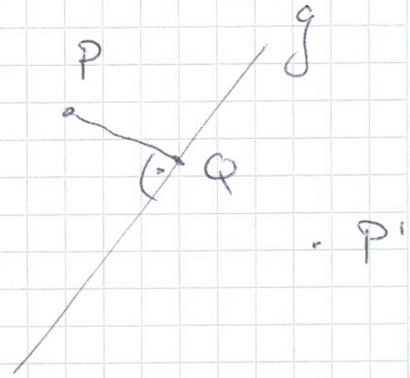
$$\text{ArcCos}\left(\frac{\sqrt{210}}{21}\right) \triangleq \underline{\underline{46.365°}}$$

$$\text{TR}: \quad \text{ArcCos}\left(\frac{\text{dotP}(b,d)}{\sqrt{\text{dotP}(b,b)\cdot\text{dotP}(d,d)}}\right)$$

6 $g: \; x - 3y + 11 = 0 \qquad y = \frac{1}{3}x + \frac{11}{3}$

$$\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}-2\\3\end{pmatrix} + s\underbrace{\begin{pmatrix}3\\1\end{pmatrix}}_{\vec g}$$

$P(5/12)$;



$$\vec r_Q = \begin{pmatrix}-2\\3\end{pmatrix} + s\begin{pmatrix}3\\1\end{pmatrix}$$

$$= \begin{pmatrix}3s-2\\s+3\end{pmatrix}, \text{ da } Q \in g$$

$$\vec{PQ} = \vec r_Q - \vec r_P = \begin{pmatrix}3s-2\\s+3\end{pmatrix} - \begin{pmatrix}5\\12\end{pmatrix} = \begin{pmatrix}3s-7\\s-9\end{pmatrix}$$

$$\vec{PQ} \perp \vec g \Rightarrow \vec{PQ}\cdot\vec g = 0 :$$

$$\begin{pmatrix}3s-7\\s-9\end{pmatrix}\begin{pmatrix}3\\1\end{pmatrix} = 3(3s-7) + s - 9 = 0$$

$$s = 3$$

$$\vec r_Q = \begin{pmatrix}-2\\3\end{pmatrix} + 3\begin{pmatrix}3\\1\end{pmatrix}$$

$$= \cancel{\begin{pmatrix}7\\10\end{pmatrix}} = \begin{pmatrix}7\\6\end{pmatrix}; \quad Q(7/6)$$

$$\vec r_{P'} = \vec r_P + 2\vec{PQ} = \begin{pmatrix}9\\0\end{pmatrix}; \quad \underline{\underline{P'(9/0)}}$$

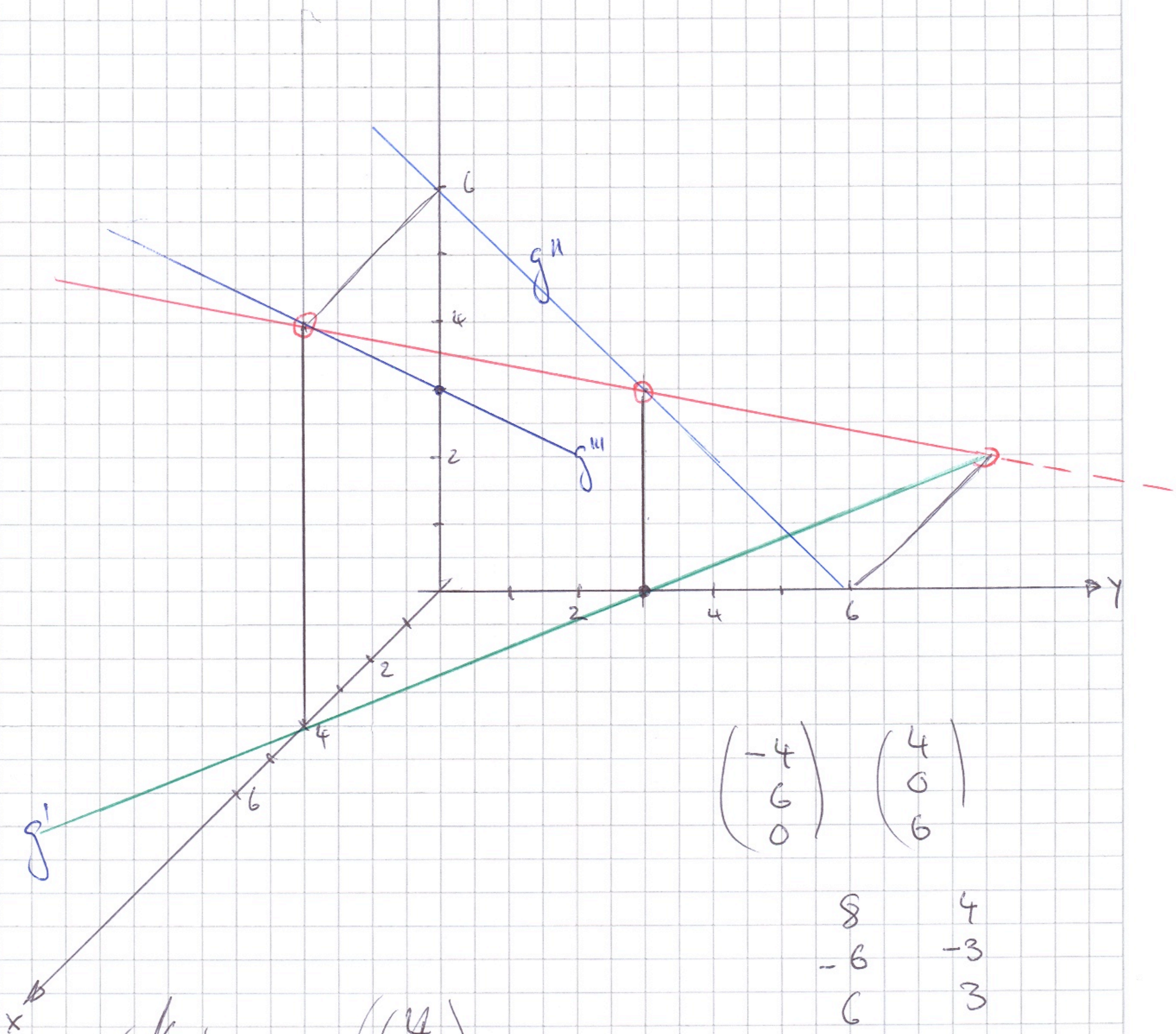
5 $\quad \vec{g} = \begin{pmatrix} 4 \\ 1 \\ 2 \end{pmatrix}$; $\quad \vec{h} = \begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix}$

$\quad \hookrightarrow b \qquad \hookrightarrow d$

$$\alpha = \operatorname{arc\,tan}\left(\frac{\vec{g} \cdot \vec{h}}{g \cdot h}\right) = \operatorname{arc\,tan}\left(\frac{\sqrt{210}}{21}\right)$$

TR: g, h unter b und d gespeichert:

$$\alpha = \operatorname{arc\,tan}\left(\frac{\mathrm{dotP}(b,d)}{\sqrt{\mathrm{dotP}(b,b) \cdot \mathrm{dotP}(d,d)}}\right)$$



$$\begin{pmatrix}-4\\6\\0\end{pmatrix} \quad \begin{pmatrix}4\\0\\6\end{pmatrix}$$

$$\begin{matrix}8 & 4\\-6 & -3\\6 & 3\end{matrix}$$

$$\cancel{\begin{pmatrix}6\\3\\6\end{pmatrix}} + s\begin{pmatrix}4\\-3\\3\end{pmatrix}$$

$\cancel{x=0 : s=1,5}$

$$\boxed{\begin{pmatrix}-8\\9\\-3\end{pmatrix} + s\begin{pmatrix}4\\-3\\3\end{pmatrix}}$$

S_2 : $x=0$: $s=2$: $(0|3|3)$

S_3 : $y=0$: $s=3$: $(4|0|6)$

S_1 : $z=0$: $s=1$: $(-4|6|0)$