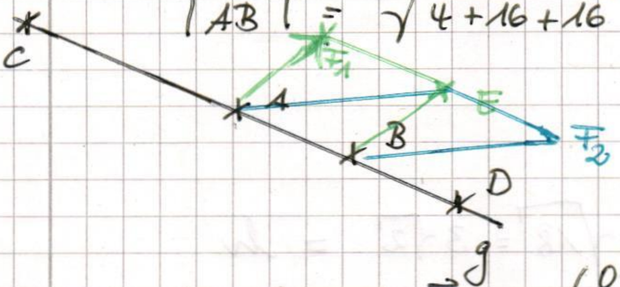
Abitur 2015 – A1 – GEO

Aufgabe 1

a) g: $A(0|1|2)$, $B(2|5|6)$

$$\vec{AB} = \begin{pmatrix} 2-0 \\ 5-1 \\ 6-2 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ 4 \end{pmatrix}$$

$$|\vec{AB}| = \sqrt{4+16+16} = \sqrt{36} = \underline{\underline{6 = d(A,B)}}$$



$$\vec{c} = \vec{a} - 2\cdot\vec{AB} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} - 2\cdot\begin{pmatrix} 2 \\ 4 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ -7 \\ -6 \end{pmatrix}$$

$$\vec{d} = \vec{a} + 2\cdot\vec{AB} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} + 2\cdot\begin{pmatrix} 2 \\ 4 \\ 4 \end{pmatrix} = \begin{pmatrix} 4 \\ 9 \\ 10 \end{pmatrix}$$

Also: $\underline{\underline{C(-4|-7|-6)}}$ und $\underline{\underline{D(4|9|10)}}$

b) $E(1|2|5)$

$$\vec{f_1} = \vec{a} + \vec{BE} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} + \begin{pmatrix} 1-2 \\ 2-5 \\ 5-6 \end{pmatrix} = \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}; \quad \underline{\underline{F_1(-1|-2|1)}}$$

$$\vec{f_2} = \vec{b} + \vec{AE} = \begin{pmatrix} 2 \\ 5 \\ 6 \end{pmatrix} + \begin{pmatrix} 1-0 \\ 2-1 \\ 5-2 \end{pmatrix} = \begin{pmatrix} 3 \\ 6 \\ 9 \end{pmatrix}; \quad \underline{\underline{F_2(3|6|9)}}$$

Aufgabe 2

Pyramide ABCDS

$A(0|0|0)$, $B(4|4|2)$, $C(8|0|2)$,
$D(4|-4|0)$, $S(1|1|-4)$

ABCD Parallelogramm

a) Rechteck: z.z. $\sphericalangle BAC = 90^\circ$, also $\vec{AB} \perp \vec{AD}$

$$\vec{AB} = \begin{pmatrix} 4-0 \\ 4-0 \\ 2-0 \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \\ 2 \end{pmatrix}$$

$$\vec{AD} = \begin{pmatrix} 4-0 \\ -4-0 \\ 0-0 \end{pmatrix} = \begin{pmatrix} 4 \\ -4 \\ 0 \end{pmatrix}$$

$$\vec{AB} \circ \vec{AD} = \begin{pmatrix} 4 \\ 4 \\ 2 \end{pmatrix} \circ \begin{pmatrix} 4 \\ -4 \\ 0 \end{pmatrix} = 16 - 16 + 0 = 0$$

$$\Rightarrow \vec{AB} \perp \vec{AD}$$

b)

$$\vec{AS} = \begin{pmatrix} 1-0 \\ 1-0 \\ -4-0 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ -4 \end{pmatrix}$$

$$|\vec{AS}| = \sqrt{1+1+16} = \sqrt{18} = 3\sqrt{2} = h$$

$$V = \frac{1}{3} G \cdot h = \frac{1}{3} \cdot 24\sqrt{2} \cdot 3\sqrt{2} = \underline{\underline{48}}$$