1 (3P)

$$\underbrace{3\sin(2x)}_{2\cdot\sin(x)\cos(x)}\underbrace{\tan(x)}_{\frac{\sin(x)}{\cos(x)}} = -\cos(x) \qquad \mathbb{D}_{max} = [0; 3\pi]$$

$$\Rightarrow \quad 6\cdot\sin(x)\cancel{\cos(x)}\cdot\frac{\sin(x)}{\cancel{\cos(x)}} = -\cos(x)$$

$$6\underbrace{\sin^2(x)}_{1-\cos^2(x)} + \cos(x) = 0$$

1

$$\Rightarrow \quad 6 - 6\cos^2(x) + \cos(x) = 0$$

$$\underline{6\cos^2(x) - \cos(x) - 6 = 0}$$

Substitution

$$a = \cos(x) \quad \Rightarrow \quad 6a^2 - a - 6 = 0$$

$$a_{1/2} = \frac{1 \pm \sqrt{1+4\cdot 6\cdot 6}}{12} = \frac{1\pm\sqrt{145}}{12}$$

$$a_1 = -0{,}9201$$

$$a_2 = 1{,}0868 \notin \mathbb{L} \;!$$

1

$$\Rightarrow \quad a_1 = \cos(x_1)$$

$$\underline{x_1} = \cos^{-1}(a_1) = \underline{2{,}7392}$$

Lösungen im Intervall / Periodizität

1

$$x_1 = 2{,}7392$$

$$x_2 = 2\pi - 2{,}7392 = 3{,}5440$$

$$x_3 = 2\pi + 2{,}7392 = 9{,}0224$$

$$\mathbb{L} = \{2{,}7392;\ 3{,}5440;\ 9{,}0224\}$$

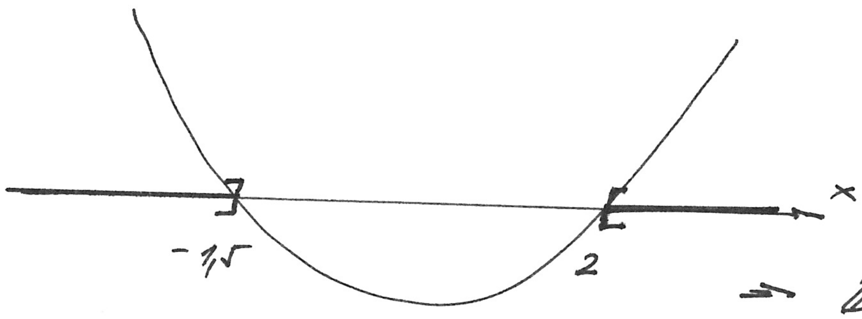
prop. Abzüge

2 (5P)

$$f(x) = \sqrt{(x-2)(2x+3)}$$

I $\underline{D_f:}$ $(x-2)(2x+3) \geq 0$

$\Rightarrow (x-2)(2x+3) = 0$ $\quad x_1 = 2$, $\quad x_2 = -1{,}5$



$\Rightarrow D_f = \mathbb{R} \setminus]-1{,}5; 2[$

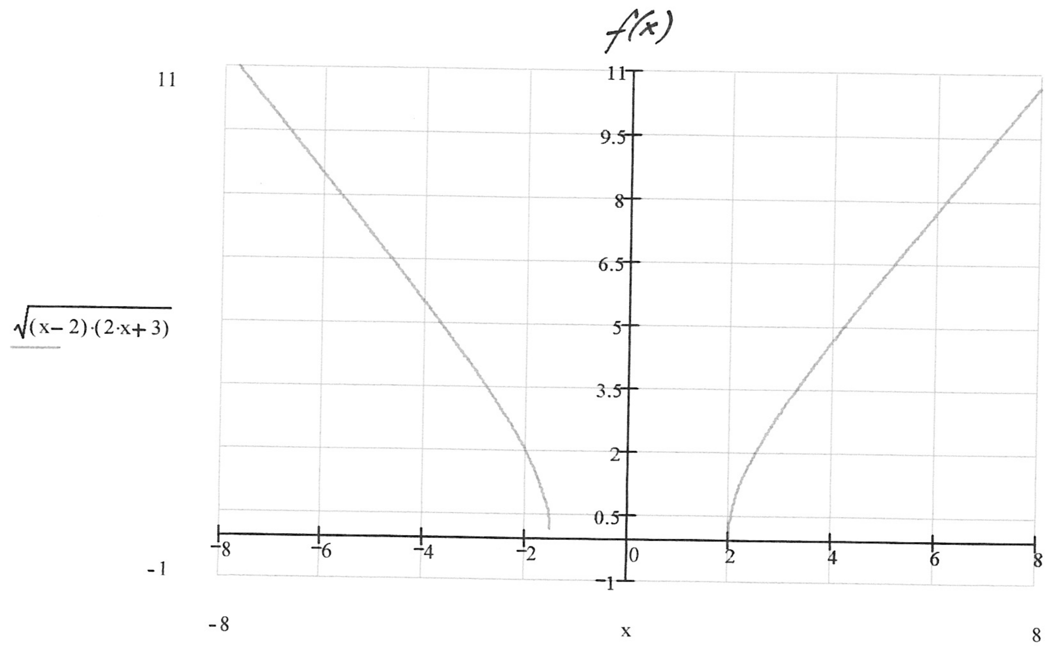
0,5

II $W_f = \mathbb{R}_0^+ = [0; \infty[$

0,5

III

-8	-7	-6	-5	-4	-3	-2	-1,5	2	3	4	5	6	7	8
11,40178	9,9450	8,4853	7	5,4772	3,8730	2	0	0	3	4,6904	6,2450	7,7460	9,2195	10,6771



3,5

IV Fortsetzung A2

$$f(x) = \sqrt{(x-2)(2x+3)}$$

$$(y)^2 = \left(\sqrt{(x-2)(2x+3)}\right)^2$$

$$y^2 = (x-2)(2x+3)$$

$$y^2 = 2x^2 - x - 6$$

$$2x^2 - x - 6 - y^2 = 0$$

$$2x^2 - x - (6+y^2) = 0 \Rightarrow x_{1/2} = \frac{1 \pm \sqrt{1 + 4\cdot 2(6+y^2)}}{4}$$

$$x_{1/2} = 0{,}25 \pm \sqrt{\frac{8y^2+49}{16}}$$

$$\Rightarrow y_{1/2} = \pm\sqrt{0{,}5x^2 + 3{,}0625} + 0{,}25$$

1

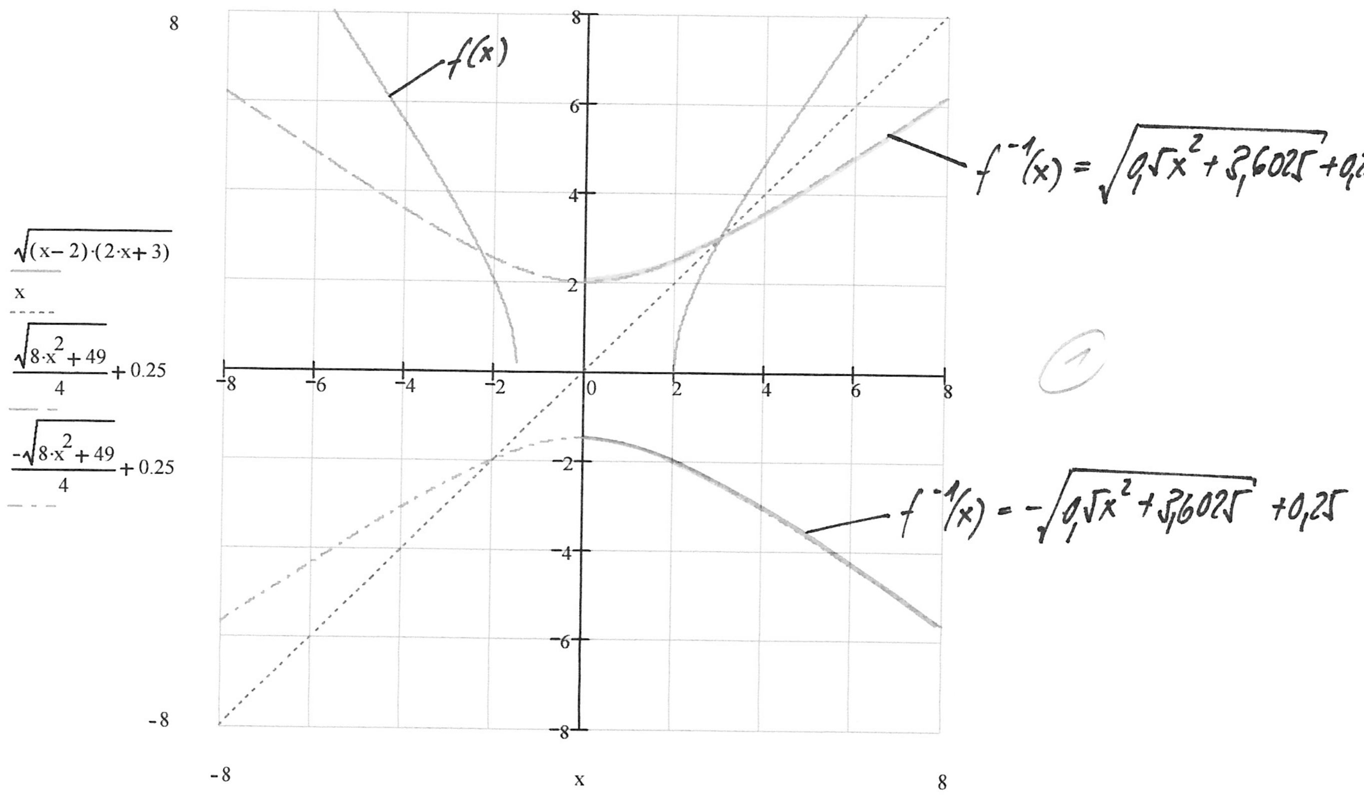
$$\Rightarrow \underline{\underline{f^{-1}(x) = \pm\sqrt{0{,}5x^2 + 3{,}0625} + 0{,}25}}$$

V

$$\underline{\underline{D_{f^{-1}} = \mathbb{R}_0^+}} \wedge \underline{\underline{W_{f^{-1}} = \mathbb{R} \setminus]-1{,}5;2[}}$$

0,5

VI



1

3 (3P)

$$\left|\begin{array}{ccccc} x & - & y & = & 4 \\ \dfrac{x}{2a-b} & + & \dfrac{y}{a-2b} & = & \dfrac{1}{2b-a} \\ ① & & ② & & ③ \end{array}\right| \begin{array}{l} 1) \\ \\ 2) \end{array}$$

$\mathbb{D}_x = \mathbb{D}_y = \mathbb{R}$

0,5

① $2a - b \neq 0 \Rightarrow a \neq \frac{b}{2}$

② = ③ $\Rightarrow a - 2b \neq 0 \Rightarrow a \neq 2b$

1) $x = 4 + y \Rightarrow$ 2) $\dfrac{x}{2a-b} - \dfrac{y}{2b-a} = \dfrac{1}{2b-a}$

$$\frac{4+y}{2a-b} = \frac{1+y}{2b-a}$$

1,6

$$\Rightarrow (4+y)(2b-a) = (1+y)(2a-b)$$

$$8b - 4a + 2by - ay = 2a - b + 2ay - by$$

$$9b - 6a = 3ay - 3by$$

$$3b - 2a = y(a-b)$$

$$y = \frac{3b-2a}{a-b} \wedge a \neq b$$

Abzüge/ Fehler 0,3P

$$x = 4 + \frac{3b-2a}{a-b} = \frac{4a-4b+3b-2a}{a-b}$$

$$x = \frac{2a-b}{a-b} \wedge a \neq b$$

Zusammenfassung Parameter

$a \in \mathbb{R} \setminus \{\frac{b}{2}; b; 2b\}; \; b \in \mathbb{R}$

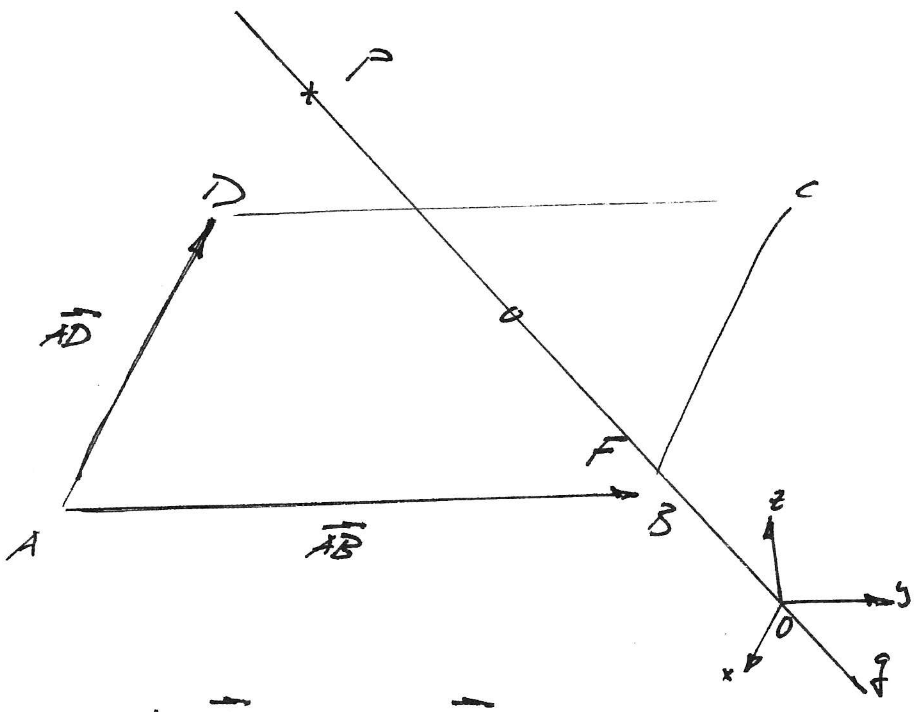
0,9

4 (3P)

$A(2/4/5)$

$\vec{AB} = \begin{pmatrix} -2 \\ 3 \\ 2 \end{pmatrix}$

$\vec{AD} = \begin{pmatrix} -3 \\ 3 \\ 6 \end{pmatrix}$



$\underline{F \in E}$

$$E: \quad \vec{r} = \vec{r}_A + \lambda \vec{AB} + \mu \vec{AD}$$

$$\vec{r} = \begin{pmatrix} 2 \\ 4 \\ 5 \end{pmatrix} + \lambda \begin{pmatrix} -2 \\ 3 \\ 2 \end{pmatrix} + \mu \begin{pmatrix} -3 \\ 3 \\ 6 \end{pmatrix}$$

0,9

$g: \quad P(-2/15/20) \quad \Rightarrow \quad \vec{r}_P = \begin{pmatrix} -2 \\ 15 \\ 20 \end{pmatrix}$ 0,6

$O(0/0/0)$

$$\Rightarrow g: \quad \vec{r} = t \begin{pmatrix} -2 \\ 15 \\ 20 \end{pmatrix}$$

$\underline{g \cap E}$

$$\begin{pmatrix} 2 \\ 4 \\ 5 \end{pmatrix} + \lambda \begin{pmatrix} -2 \\ 3 \\ 2 \end{pmatrix} + \mu \begin{pmatrix} -3 \\ 3 \\ 6 \end{pmatrix} = t \begin{pmatrix} -2 \\ 15 \\ 20 \end{pmatrix}$$

0,5

$\underline{3 \times 3}$

$$\left| \begin{array}{l} 2\lambda + 3\mu - 2t = 2 \\ -3\lambda - 3\mu + 15t = 4 \\ -2\lambda - 6\mu + 20t = 5 \end{array} \right| \Rightarrow \begin{pmatrix} 2 & 3 & -2 \\ -3 & -3 & 15 \\ -2 & -6 & 20 \end{pmatrix} \begin{pmatrix} \lambda \\ \mu \\ t \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ 5 \end{pmatrix}$$

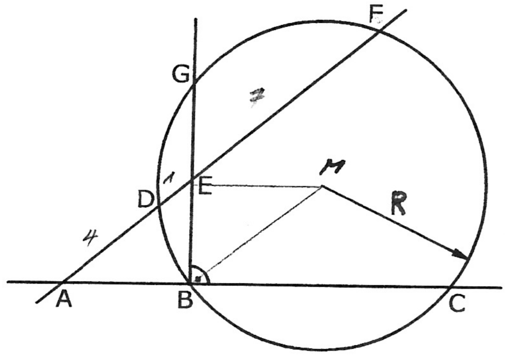
$$\Rightarrow \left. \begin{array}{l} \lambda = 0{,}5 \\ \mu = 0{,}\bar{6} \\ t = 0{,}5 \end{array} \right\}$$

0,5

Interpretation: 0,5

unsichtbar für $|\lambda| \leq 1 \wedge |\mu| \leq 1$

5 (3P)



$\overline{BE} = 9\,cm$

$\overline{EG} = 7\,cm$

$\overline{AD} : \overline{DE} : \overline{EF} = 4 : 1 : 7$

0,3

<u>Sehnensatz</u>: $\overline{BE} \cdot \overline{EG} = \overline{DE} \cdot \overline{EF} \quad \wedge \quad \overline{DE} : \overline{EF} = 1:7$

$\overline{BE} \cdot \overline{EG} = 7\overline{DE}^2 \qquad \overline{EF} = 7\overline{DE}$

0,3 0,3

$\overline{DE} = \sqrt{\frac{\overline{BE} \cdot \overline{EG}}{7}} = \sqrt{\frac{\cancel{7} \cdot 9}{\cancel{7}}} = \underline{3\,cm}$

$\Rightarrow \underline{\overline{EF} = 21\,cm}$ 0,3 / $\underline{\overline{AD} = 12\,cm}$ 0,3

<u>Pythagoras</u>: 0,3 $R^2 = \left(\frac{\overline{BE} + \overline{EG}}{2}\right)^2 + \overline{EM}^2 \qquad \overline{EM} = \frac{\overline{BC}}{2}$

0,3 $\overline{AE}^2 = \overline{BE}^2 + \overline{AB}^2 \quad \wedge \quad \overline{AE} = \overline{AD} + \overline{DE}$

$\overline{AE} = 15\,cm$

$\Rightarrow \overline{AB} = \sqrt{15^2 - 9^2}$

$\underline{\overline{AB} = 12\,cm} \quad \Rightarrow \quad \overline{AB} = \overline{AD}$

0,3

$\Rightarrow$ <u>Sekantensatz</u>

$\overline{AD} \cdot \overline{AF} = \overline{AB} \cdot \overline{AC}$

0,3

$\Rightarrow \overline{DF} = \overline{BC} = \underline{24\,cm}$

<u>Radius</u>:

$R^2 = 8^2 + 12^2$

0,3

$\underline{R} = \sqrt{8^2 + 12^2} = \underline{\underline{14{,}42\,cm}}$

· prop. Abzüge

6 (5P)

$f(x) = 4^{x-3} - 2 \quad ; \quad D_f = \mathbb{R}$

I $\quad f(x) = 0 \quad \Rightarrow \quad 4^{x-3} - 2 = 0$

$2^{2(x-3)} - 2 = 0$

$2^{2(x-3)} = 2$

0,5

$\Rightarrow \quad 2(x-3) = 1$

$\underline{\underline{x = 3,5}} \quad \Rightarrow \quad \underline{\underline{P_x(3,5/0)}}$

II $\quad \underline{x \to \pm\infty}$

$\left.\begin{array}{l} \Rightarrow \quad x \to -\infty \quad \Rightarrow \quad f(x) \to -2 \\ \quad\;\; x \to +\infty \quad \Rightarrow \quad f(x) \to +\infty \end{array}\right\} \Rightarrow \underline{\underline{W_f =]-2; \infty[}}$

0,5

III $\quad f(x) = 4^{x-3} - 2$

$y = 4^{x-3} - 2$

$y + 2 = 4^{x-3} \quad / \log_4()$

$\log_4(y+2) = x - 3$

1

$\log_4(y+2) + 3 = x \quad \Rightarrow \quad \underline{\underline{f^{-1}(x) = \log_4(x+2) + 3}}$

IV $\quad \underline{\underline{D_{f^{-1}} =]-2; \infty[}} \quad \wedge \quad \underline{\underline{W_{f^{-1}} = \mathbb{R}}}$

0,5

Fortsetzung A6

V $\quad f^{-1}(x) = \log_4(x+2)+3$

$\rightarrow \vec{v} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

1

$\rightarrow h(x) = \log_4(x+2-2)+3-4$

$\underline{\underline{h(x) = \log_4(x) - 1}}$ $\qquad \underline{\mathbb{D}_h =]0;\infty[}$

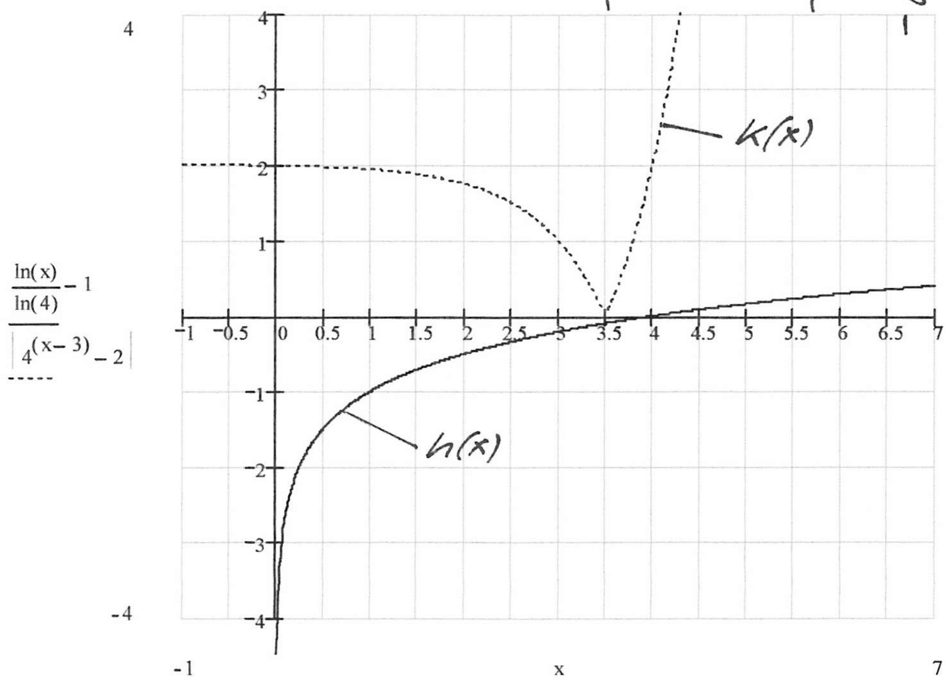
$\underline{\mathbb{W}_h = \mathbb{R}}$

VI $\quad k(x) = |4^{x-3} - 2| \rightarrow$ kein neg. Funktionswerte

$h(x) = \log_4(x) - 1$

Wertetabelle $[-1;7]$

x	-1	-0,5	0	0,5	1	1,5	2	2,5	3	4	5	6	7
k(x)	1,9961	1,9922	1,9844	1,9688	1,9375	1,875	1,75	1,5	1	2	14	62	254
h(x)	–	–	$-\infty$	-1,5	-1	-0,7075	-0,5	-0,3390	-0,2075	0	0,1610	0,2925	0,4037



1,5

7 (3P)

$$\sqrt{4x+1} + \sqrt{3x-2} = \sqrt{13x-1}$$

① ② ③

<u>D</u>

① $4x+1 \geq 0$

$x \geq -\frac{1}{4}$

③ $13x-1 \geq 0$

$x \geq \frac{1}{13}$

0,8

② $3x-2 \geq 0$

$x \geq \frac{2}{3}$ $\Rightarrow$ $\underline{\underline{\mathbb{D} = \left[\frac{2}{3}; \infty\right[}}$

$$\left(\sqrt{4x+1} + \sqrt{3x-2}\right)^2 = \left(\sqrt{13x-1}\right)^2$$

$$4x+\cancel{1} + 2\sqrt{(4x+1)(3x-2)} + 3x-\cancel{2} = 13x-\cancel{1}$$

$$\cancel{2}\left(\sqrt{(4x+1)(3x-2)}\right)^2 = (\overset{3}{\cancel{6}}x)^2$$

$$(4x+1)(3x-2) = 9x^2$$

· Abzüge 0,3

$$12x^2 - 5x - 2 = 9x^2$$

1,8

$$\underline{3x^2 - 5x - 2 = 0}$$

$$x_{1/2} = \frac{5 \pm \sqrt{25 + 4\cdot 3\cdot 2}}{6} = \frac{5 \pm 7}{6}$$

$\underline{x_1 = 2}$

$x_2 = -\frac{1}{3} \notin \mathbb{D}$

<u>Kontrolle</u> $x_1 = 2$

$$\sqrt{4\cdot 2+1} + \sqrt{3\cdot 2-2} = 3+2 = \underline{5}$$

$$\sqrt{13\cdot 2-1} = \underline{5}$$

0,4

$\Rightarrow$ $\underline{\underline{\mathbb{L} = \{2\}}}$

I $\underline{g \subset E}$

$$g: \vec{r} = \underbrace{\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}}_{\vec{r}_P} + \lambda \underbrace{\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}}_{\vec{a}} \qquad E: x + y + z - 3 = 0$$

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

$\underline{g \subset E:}$ $\quad \vec{a} \cdot \vec{n} = 0 \ \wedge \ \vec{n} \cdot \vec{r}_P - 3 \overset{!}{=} 0$

$$\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = 3 - 2 - 1 = 0$$

$$\wedge \quad \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} - 3 = 3 - 3 = 0$$

$$h: \vec{r} = \underbrace{\begin{pmatrix} 7 \\ 6 \\ 5 \end{pmatrix}}_{\vec{r}_P} + \mu \underbrace{\begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}}_{\vec{a}} \qquad E: x + y + z - 3 = 0$$

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

$\vec{n} \cdot \vec{a} = 0 \Rightarrow \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \circ \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} = 1 + 0 - 1 = 0$ $\underline{\text{ok}}$

$\vec{r}_P \notin E$

$\Rightarrow \quad \vec{n} \cdot \vec{r}_P - 3 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \begin{pmatrix} 7 \\ 6 \\ 5 \end{pmatrix} - 3 = \underline{\underline{7 + 6 + 5 - 3 \neq 0}}$

$\Rightarrow \underline{h \parallel E!}$

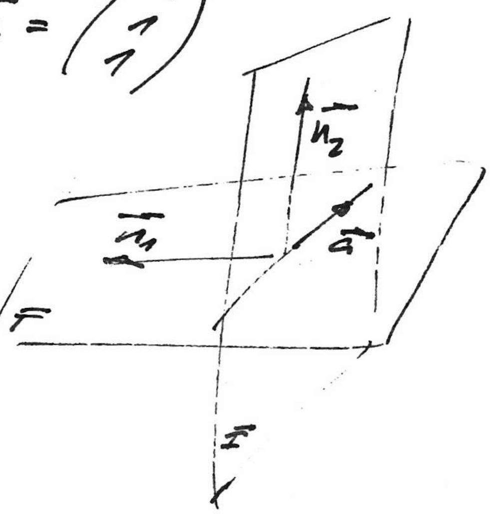
1

• prop. Abzüge

II $F \perp E \quad \wedge \quad F \cap E = g$

$$E: x + y + z - 3 = 0 \rightarrow \vec{n}_1 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$g: \vec{r} = \underbrace{\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}}_{\vec{r}_P} + \lambda \underbrace{\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}}_{\vec{a}}$$



$$\underline{\vec{n}_2} = \vec{a} \times \vec{n}_1 = \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} \times \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} \begin{vmatrix} -2 & 1 \\ -1 & 1 \end{vmatrix} \\ -\begin{vmatrix} 3 & 1 \\ -1 & 1 \end{vmatrix} \\ \begin{vmatrix} 3 & 1 \\ -2 & 1 \end{vmatrix} \end{pmatrix} = \underline{\begin{pmatrix} -1 \\ -4 \\ 5 \end{pmatrix}}$$

1P

• Abgänge prop.

$$F: \quad \vec{n}_2(\vec{r} - \vec{r}_P) = 0$$

$$\begin{pmatrix} -1 \\ -4 \\ 5 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} - \underbrace{\begin{pmatrix} -1 \\ -4 \\ 5 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}}_{} = 0 \Rightarrow -x - 4y + 5z = 0$$

$$F: \underline{\underline{x + 4y - 5z = 0}}$$

III $E: \; x + y + z - 3 = 0$

Eine Ebene kann nicht zu allen drei Koordinatenachsen parallel sein. Ich wähle deshalb die Koordinaten x und y eines auf der Ebene liegenden Punktes als Parameter λ und μ.

$$\left.\begin{matrix} x = \lambda \\ y = \mu \end{matrix}\right\} \Rightarrow \lambda + \mu + z - 3 = 0$$

$$z = 3 - \lambda - \mu$$

$$\underline{\underline{E: \vec{r} = \begin{pmatrix} 0 \\ 0 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}}}$$

1P

Fortsetzung A8

IV

$G \perp xy\text{-Ebene} \wedge g \subset G$

$xy\text{-Ebene}: \quad z = 0 \Rightarrow \vec{n}_1 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$

$G: \quad \vec{n}_2 (\vec{r} - \vec{r}_P) = 0$

$g: \quad \vec{r} = \underbrace{\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}}_{\vec{r}_P} + \lambda \underbrace{\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}}_{\vec{a}}$

$\underline{\vec{n}_2} = \vec{n}_1 \times \vec{a} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \times \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} = \begin{pmatrix} \begin{vmatrix} 0 & -2 \\ 1 & -1 \end{vmatrix} \\ -\begin{vmatrix} 0 & 3 \\ 1 & -1 \end{vmatrix} \\ \begin{vmatrix} 0 & 3 \\ 0 & -2 \end{vmatrix} \end{pmatrix} = \underline{\begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}}$

$G: \quad \begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} = 0$

$2x + 3y - (2 + 3 + 0) = 0$

1

$G: \quad \underline{\underline{2x + 3y - 5 = 0}}$

V

$g: \quad \vec{r} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}$

$h: \quad \vec{r} = \begin{pmatrix} 7 \\ 6 \\ 5 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$

Parallelität: $\left.\begin{array}{l} \vec{a} = \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} \\ \vec{b} = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} \end{array}\right\} \vec{a} \nparallel \vec{b}$

$\Rightarrow$ keine Identität

$\Rightarrow$ windschief

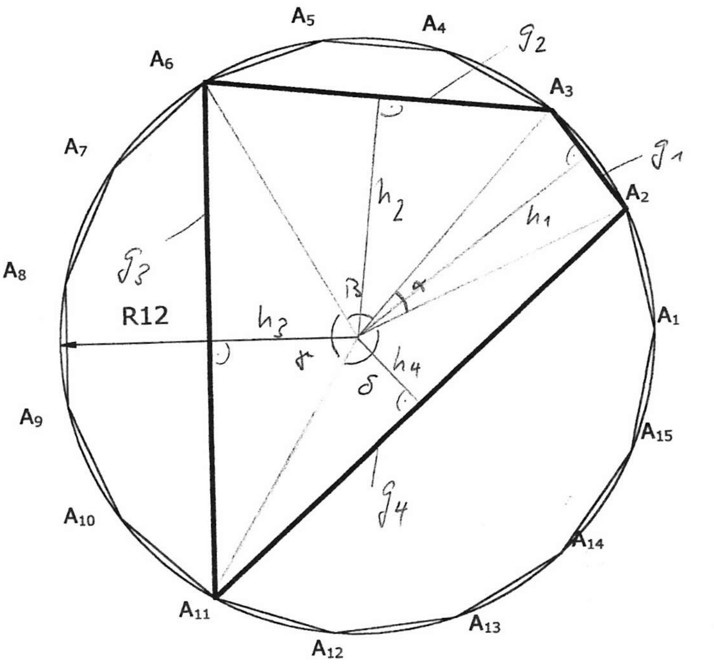
1

$D(\vec{a}, \vec{b}, \vec{r}_1 - \vec{r}_2) = \begin{vmatrix} 3 & 1 & 6 \\ -2 & 0 & 5 \\ -1 & -1 & 4 \end{vmatrix} = \underline{30}$

$\vec{r}_1 - \vec{r}_2 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} - \begin{pmatrix} 7 \\ 6 \\ 5 \end{pmatrix} = \begin{pmatrix} -6 \\ -5 \\ -4 \end{pmatrix} \Rightarrow \vec{r}_2 - \vec{r}_1 = \begin{pmatrix} 6 \\ 5 \\ 4 \end{pmatrix}$

$\Rightarrow D \neq 0 \Rightarrow$ $\underline{\underline{g \wedge h \text{ sind windschief}}}$

9 (4P)



$\alpha = \frac{360}{15} = 24°$

$\beta = 3\alpha = 72°$

$\gamma = 5\alpha = 120°$

$\delta = 6\alpha = 144°$

0,8

Dreiecksfläche : $A = \frac{g \cdot h}{2}$

Höhen:

$h_1 = R \cdot \cos\frac{\alpha}{2} = 12 \cdot \cos 12° = 11{,}74$

$h_2 = R \cdot \cos\frac{\beta}{2} = 12 \cdot \cos 36° = 9{,}71$

$h_3 = R \cdot \cos\frac{\gamma}{2} = 12 \cdot \cos 60° = 6$

$h_4 = R \cdot \cos\frac{\delta}{2} = 12 \cdot \cos 72° = 3{,}71$

0,8

Grundlinien:

$g_1 = 2 \cdot R \cdot \sin\frac{\alpha}{2} = 2 \cdot 12 \cdot \sin 12° = 4{,}99$

$g_2 = 2 \cdot R \cdot \sin\frac{\beta}{2} = 2 \cdot 12 \cdot \sin 36° = 14{,}11$

$g_3 = 2 \cdot R \cdot \sin\frac{\gamma}{2} = 2 \cdot 12 \cdot \sin 60° = 20{,}78$

$g_4 = 2 \cdot R \sin\frac{\delta}{2} = 2 \cdot 12 \cdot \sin 72° = 22{,}83$

1,2

$\Rightarrow$ Umfang $U = \sum_{i=1}^{4} g_i = 62{,}71$

Fläche: $A = \sum_{i=1}^{4} A_i = \frac{g_1 \cdot h_1}{2} + \frac{g_2 h_2}{2} + \frac{g_3 h_3}{2} + \frac{g_4 h_4}{2}$

$A = \frac{1}{2}(4{,}99 \cdot 11{,}74 + 14{,}11 \cdot 9{,}71 + 20{,}78 \cdot 6 + 22{,}83 \cdot 3{,}71)$

1,2

$A = 202{,}44$

10 (3P)

I

P_1 : $\quad p_1(x) = a_1(x+u_1)^2 + v_1 \quad \Rightarrow S_1(1/-3)$

$\Rightarrow p_1(x) = a_1(x-1)^2 - 3 \quad \Rightarrow A_1 \in P_1$

$A_1(3/-1)$

$\Rightarrow p_1(3) = a_1(3-1)^2 - 3 = -1$

$\underline{a_1} = \frac{2}{4} = \underline{0{,}5}$

$\Rightarrow \underline{\underline{p_1(x) = 0{,}5(x-1)^2 - 3}}$

P_2 : $\quad p_2(x) = a_2(x+u_2)^2 + v_2 \quad \Rightarrow S_2(-3/5)$

$\Rightarrow p_2(x) = a_2(x+3)^2 + 5 \quad \Rightarrow A_2 \in P_2$

$A_2(0/-4)$

$\Rightarrow p_2(0) = a_2 \cdot 3^2 + 5 = -4$

$\underline{a_2 = -1}$

1

$\Rightarrow \underline{\underline{p_2(x) = -(x+3)^2 + 5}}$

II

$\mathbb{D}_{P_1} = \mathbb{R} \qquad \mathbb{D}_{P_2} = \mathbb{R}$

$\underline{\underline{\mathbb{W}_{P_1} = [-3; \infty[}} \qquad \underline{\underline{\mathbb{W}_{P_2} =]-\infty; 5]}}$

1

III

$p_1(x) = p_2(x)$

$0{,}5(x-1)^2 - 3 = -(x+3)^2 + 5$

$0{,}5(x^2 - 2x + 1) - 3 = -(x^2 + 6x + 9) + 5$

1

$0{,}5x^2 - x - 2{,}5 = -x^2 - 6x - 4$

$\underline{1{,}5x^2 + 5x + 1{,}5 = 0}$

$x_{1/2} = \frac{-5 \pm \sqrt{-4 \cdot 1{,}5 \cdot 1{,}5 + 25}}{3} = \frac{-5 \pm \sqrt{16}}{3} \quad \begin{cases} x_1 = -3 \\ \underline{x_2 = \frac{-1}{3}} \end{cases}$

$\Rightarrow \underline{\underline{E_1(-3/5)}}$ ($\equiv$ Scheitelpunkt S_2)

E_2 : $p_2(\frac{-1}{3}) = -(\frac{-1}{3} + 3)^2 + 5 = -2{,}\overline{11} \Rightarrow \underline{\underline{E_2(\frac{-1}{3} / \frac{-19}{9})}}$