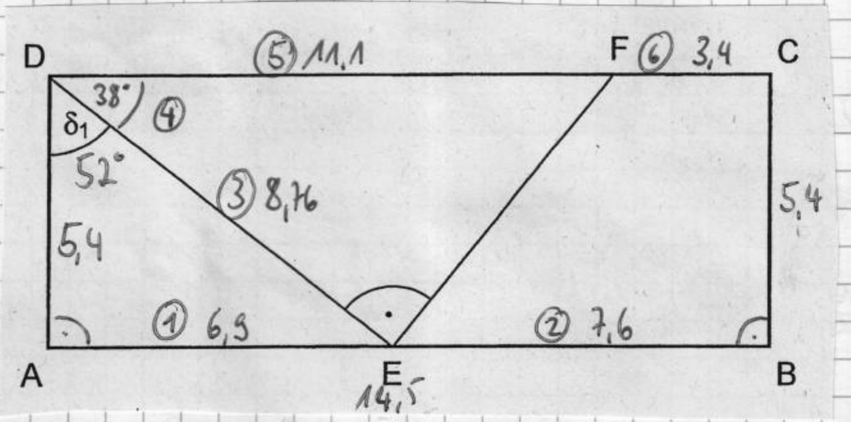
P1

HT 2018
P1/P2



(1) $\overline{AE}$: $\tan(52) = \frac{\overline{AE}}{5,4} \quad | \cdot 5,4$

$\overline{AE} = 6,9\,cm$

(2) $\overline{AB} - \overline{AE} = \overline{BE}$

$14,5 - 6,9 = 7,6\,cm$

(3) $a^2 + b^2 = c^2$

$5,4^2 + 6,9^2 = c^2$

$\overline{DE} = 8,76\,cm$

(4) $90° - 52° = 38°$

(5) $\overline{DF}$: $\cos(38°) = \frac{8,76}{\overline{DF}}$

$\overline{DF} = 11,1\,cm$

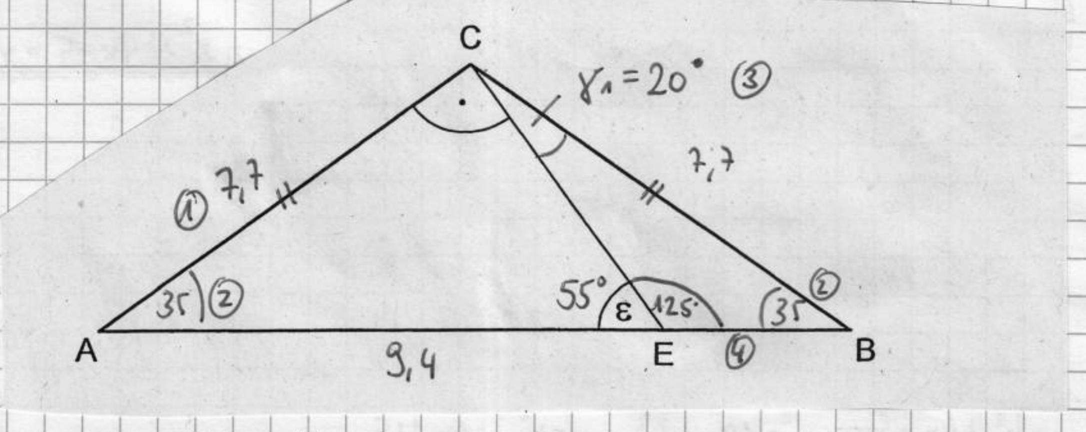
(6) $\overline{CF}$: $\overline{CD} - \overline{DF} = \overline{CF}$

$14,5 - 11,1 = 3,4\,cm$

(7) $A_{\triangle} = \frac{(a+c)}{2} \cdot h$

$A = \frac{(7,6 + 3,4)}{2} \cdot 5,4 = \underline{\underline{29,7\,cm^2}}$

P2



(1) $\overline{AC}$: $\sin(55) = \frac{\overline{AC}}{9,4}$

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

$\Rightarrow BC = 7,7\,cm$

(2) α: $180 - 90 - 55 = 35°$

$\Rightarrow \beta = 35°$

(3) $\Rightarrow \gamma = 180 - 35 - 35 = 110$

$\Rightarrow \gamma_1 = 110 - 90 = 20$

(4) $\frac{\overline{EB}}{\sin(20)} = \frac{7,7}{\sin(125)}$

$\underline{\underline{\overline{EB} = 3,2\,cm}}$

P3/W2
HT
2018

(P3) Variante Logik:

x	0	1	2	3	4	5	6
y	5	0	-3	-4	-3	0	5

1P

(1.) Mitte

3 dazwischen $\Rightarrow 3^2 \hat{=} 9$
$\Rightarrow$ 9 runter von 5

(2.) Scheitelpunkt ist $S(3|-4) \Rightarrow y=(x-3)^2-4$
$\underline{\underline{y=x^2-6x+5}}$ 1,5

Variante Rechnung: $P_1(0|5)$ $P_2(6|5)$ $y=x^2+px+q$

$5=0^2+0p+q$ $\quad 5=36+6p+q$

$5=q \xrightarrow{\text{einsetzen}} 5=36+6p+5$

$p=-6 \Rightarrow \underline{\underline{y=x^2-6x+5}}$

Schnittpunkt mit der y-Achse laut Wertetabelle $\Rightarrow R(0|5)$ 0,5

Steigung zwischen $R(0|5)$ und $S(3|-4)$: $m=\frac{y_2-y_1}{x_2-x_1}=\frac{5+4}{0-3}=\frac{9}{-3}=\underline{\underline{-3}}$ 1 / 4

(W2)
a) p_1: $N_1(-5|0)$ $N_2(1|0) \Rightarrow (x+5)(x-1)=0 \Rightarrow \underline{\underline{y=x^2+4x-5}}$

g: $S_y(0|1)$ $m=3 \Rightarrow \underline{\underline{y=3x+1}}$

p_2: $S_2(5|-2) \Rightarrow y=(x-5)^2-2 \Rightarrow \underline{\underline{y=x^2-10x+23}}$

$p_1 \cap p_2$: $x^2+4x-5=x^2-10x+23 \quad |-x^2 \; |+10x \; |+5$

$14x=28$

$x=2 \Rightarrow y=2^2+4\cdot2-5$

$y=7$ $\quad \underline{\underline{Q(2|7)}}$

Q auf g?: $7=3\cdot2+1 \checkmark \Rightarrow \underline{\underline{Q\in g}}$

h: durch $S_2(5|-2)$ und S_1: $x^2+4x-5=y$

$(x+2)^2-9=y \Rightarrow S_1(-2|-9)$

$m=\frac{y_2-y_1}{x_2-x_1}=\frac{-2+9}{5+2}=\frac{7}{7}=1 \Rightarrow y=1(x-5)-2 \Rightarrow \underline{\underline{y=x-7}}$

b) p: $y=ax^2+c$ durch $P(-3|0)$ und $S(0|-4{,}5)$

$\hookrightarrow$ in p: $-4{,}5=a\cdot0^2+c \Rightarrow \underline{\underline{c=-4{,}5}}$

$\hookrightarrow$ mit $c=-4{,}5$ in p: $0=a\cdot(-3)^2-4{,}5 \Rightarrow a=\frac{1}{2}$

$\Rightarrow \underline{\underline{y=\frac{1}{2}x^2-4{,}5}}$

g: $m=1{,}5=\frac{3}{2}$ $R(0|\frac{1}{2}) \Rightarrow y=\frac{3}{2}\cdot(x-0)+\frac{1}{2} \Rightarrow \underline{\underline{y=\frac{3}{2}x+\frac{1}{2}}}$

$g\cap p$: $\frac{3}{2}x+\frac{1}{2}=\frac{1}{2}x^2-4{,}5$

$0=x^2-3x-10$

$x_1=-2 \Rightarrow A(-2|\;) \xrightarrow{\text{in g}} A(-2|-2{,}5)$

$x_2=5 \Rightarrow C(5|\;) \Rightarrow C(5|8)$

$\Delta y=8-(-2{,}5)=10{,}5$

$\Delta x=5-(-2)=7$

A_{ABCD}: $A_{\square}=a\cdot b=7\cdot10{,}5=\underline{\underline{73{,}5\text{ FE}}}$

P4
HT
2018

P4

$$\frac{4}{x} + \frac{2x-2}{x+2} = \frac{3x^2}{x^2+2x} \qquad \mathbb{D} = \mathbb{R} \setminus \{-2; 0\}$$
$$\Big| \cdot x \cdot (x+2)$$

$$4 \cdot (x+2) + (2x-2) \cdot x = 3x^2$$
$$4x + 8 + 2x^2 - 2x = 3x^2$$
$$2x^2 + 2x + 8 = 3x^2$$
$$0 = x^2 - 2x - 8$$
$$x_{1/2} = 1 \pm \sqrt{1+8}$$
$$x_{1/2} = 1 \pm \sqrt{9}$$
$$x_1 = 1 - 3 = -2$$
$$x_2 = 1 + 3 = 4$$

$\mathbb{L} = \{4\}$
(da $x = -2 \in \mathbb{D}$)

(P5)

P5
HT
2018

$f(x) = -\frac{1}{4}x^2 + \frac{1}{2}x + 3$

$f'(x) = -\frac{1}{2}x + \frac{1}{2}$ 1

$f''(x) = -\frac{1}{2}$ 0,5

Schaubild 1,5 P

x	-3	-2	-1	0	1	2	3	4	5
$f(x)$	$-\frac{3}{4}$	1	$\frac{9}{4}$	3	$\frac{13}{4}$	3	$\frac{9}{4}$	1	$-\frac{3}{4}$

1

Schnittpunkte X-Achse: $f(x) = 0$

$0 = -\frac{1}{4}x^2 + \frac{1}{2}x + 3 \quad | \cdot (-4)$

$0 = x^2 - 2x - 12$

$x_{1/2} = 1 \pm \sqrt{13}$ $\quad N_1(1-\sqrt{13} \mid 0) \quad N_2(1+\sqrt{13} \mid 0)$

$\approx N_1(-2{,}61 \mid 0) \quad N_2(4{,}61 \mid 0)$ 1

<u>HP</u>: n.B.: $f'(x) = 0$

$0 = -\frac{1}{2}x + \frac{1}{2}$

$1 = x \Rightarrow HP(1 / \frac{13}{4})$ 1P

$f''(1) = -\frac{1}{2} \cdot (1) < 0 \Rightarrow \underline{\underline{HP}}$

Steigungswinkel an $x_1 = 1 - \sqrt{13}$

$f'(1-\sqrt{13}) = -\frac{1}{2} \cdot (1 - \sqrt{13}) + \frac{1}{2} = 1{,}8$

$\Rightarrow m = 1{,}8 \qquad \tan^{-1}(1{,}8) = \underline{61°}$ 1P

7,5P

P6
HT 2018

P6

g_1: $\perp$ zu $m = -\frac{1}{3} \Rightarrow m = 3$ durch $C(6|5)$

$y = 3 \cdot (x-6) + 5$

$y = 3x - 13$ 1P

g_2: durch $A(-2|1)$ und $C(6|5) \Rightarrow m = \frac{1-5}{-2-6} = \frac{-4}{-8} = \frac{1}{2} \Rightarrow y = \frac{1}{2}(x-6)+5$

$y = \frac{1}{2}x + 2$ 1P

g_3: $m = -1$ $S_y(0|-1) \Rightarrow y = -1x - 1$ 1P

A auf g3: $A(-2|1)$ auf g_3: $1 = -1 \cdot (-2) - 1$ ✓ $A \in g_3$ 0,5P

$1 = 1$

Schnittpunkt B: $3x - 13 = -x - 1 \quad |+x| +13$

$4x = 12$

$x = 3 \Rightarrow y = -3 - 1 = -4$ $B(3|-4)$ 1P

Prozent: $\overline{AB} = \sqrt{(-2-3)^2 + (1-(-4))^2} = \sqrt{50}$ 1,5P

$\overline{AC} = \sqrt{(-2-6)^2 + (1-5)^2} = \sqrt{80}$

$\frac{\sqrt{80} - \sqrt{50}}{\sqrt{80}} \cdot 100 = 20{,}94\% \Rightarrow \overline{AB}$ ist 20,94% kürzer als $\overline{AC}$.

Schaubild
1,5P

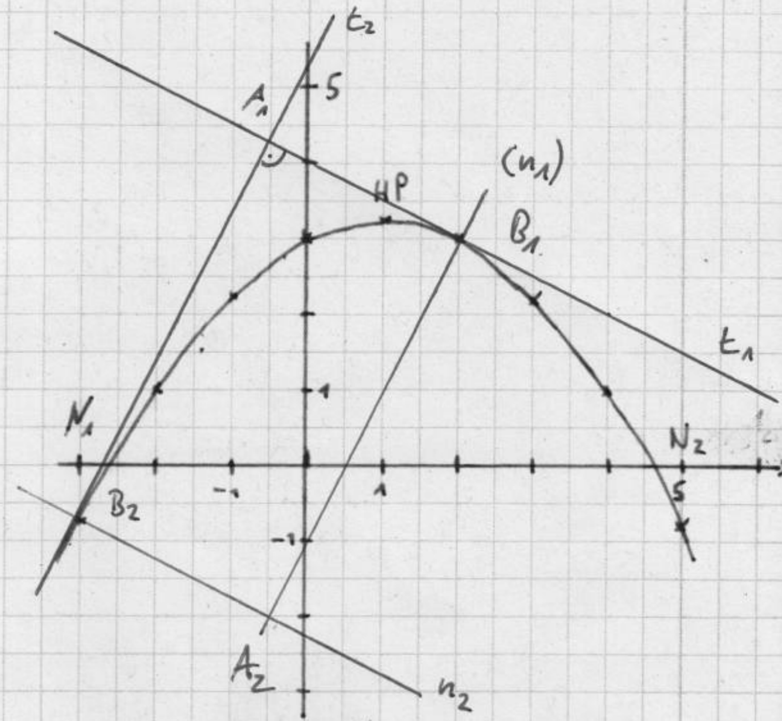
P6

$f(x) = -\frac{1}{4}x^2 + \frac{1}{2}x + 3$

$f'(x) = -\frac{1}{2}x + \frac{1}{2}$

$f''(x) = -\frac{1}{2}$

x	-3	-2	-1	0	1	2	3	4	5
$f(x)$	$-\frac{3}{4}$	1	$\frac{9}{4}$	3	$\frac{13}{4}$	3	$\frac{9}{4}$	1	$-\frac{3}{4}$



W3 t_1: durch $B_1(2/3)$

m: $f'(2) = -\frac{1}{2}\cdot 2 + \frac{1}{2} = -\frac{1}{2}$

$y = -\frac{1}{2}(x-2)+3 \Rightarrow \underline{\underline{y = -\frac{1}{2}x + 4}}$

t_2: $m_1 = -\frac{1}{2} \xRightarrow{\text{neg. kehrwert}} m_2 = 2$

⇝ an welcher Stelle hat K_f die Steigung 2

$f'(x) = 2 \quad 2 = -\frac{1}{2}x + \frac{1}{2} \Rightarrow x = -3$
$\Rightarrow B_2(-3/-\frac{3}{4})$

$\Rightarrow t_2$: $y = 2(x-(-3)) - \frac{3}{4} \Rightarrow \underline{\underline{y = 2x + \frac{21}{4}}}$

n_2: $m_2 = 2 \Rightarrow m_{n_2} = -\frac{1}{2}$ durch $B_2(-3/-\frac{3}{4})$

$y = -\frac{1}{2}(x-(-3)) - \frac{3}{4} \Rightarrow \underline{\underline{y = -\frac{1}{2}x - \frac{9}{4}}}$

A_1: $t_1 \cap t_2$: $-\frac{1}{2}x + 4 = 2x + \frac{21}{4}$
$-\frac{5}{4} = 2{,}5x$
$x = -\frac{1}{2} \Rightarrow \underline{\underline{A_1(-\frac{1}{2}/\frac{17}{4})}}$

$n_2 \cap K_f$

S: $-\frac{1}{2}x - \frac{9}{4} = -\frac{1}{4}x^2 + \frac{1}{2}x + 3$

$0 = -\frac{1}{4}x^2 + 1x + \frac{21}{4} \quad |\cdot(-4)$

$0 = x^2 - 4x - 21$

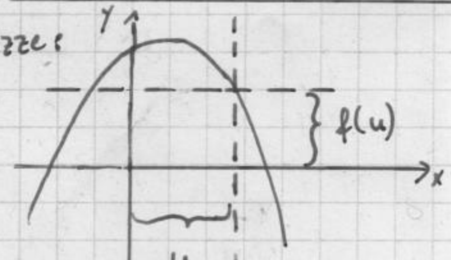
$\Rightarrow$ p-q-Formel $\Rightarrow x_1 = -3 \quad x_2 = 7 \Rightarrow \underline{\underline{S(7/-\frac{23}{4})}}$

$f(7) = -\frac{1}{4}\cdot 7^2 + \frac{1}{2}\cdot 7 + 3 = -\frac{23}{4}$

A_2: n_1: $B_1(2/3)$ $m_{n_1} = m_{t_2} = 2 \Rightarrow y = 2(x-2)+3$
$y = 2x - 1$

$n_1 \cap n_2$: $2x - 1 = -\frac{1}{2}x - \frac{9}{4}$
$\frac{5}{2}x = -\frac{5}{4}$
$x = -\frac{1}{2} \Rightarrow \underline{\underline{A_2(-\frac{1}{2}/-2)}}$

W3 b) Skizze:



$A_{\square} = u \cdot f(u)$

$a(u) = u \cdot (-\frac{1}{4}u^2 + \frac{1}{2}u + 3)$

$a(u) = -\frac{1}{4}u^3 + \frac{1}{2}u^2 + 3u$

Maximum $\Rightarrow a'(u) = 0$

$a'(u) = -\frac{3}{4}u^2 + u + 3$

$0 = -\frac{3}{4}u^2 + u + 3 \quad | : (-\frac{3}{4})$

$0 = u^2 - \frac{4}{3}u - 4$

$x_{1,2} = \frac{2}{3} \pm \sqrt{\frac{4}{3} + \frac{36}{3}} \approx 3{,}6$

Bei $u = 3{,}6$ ist der Flächeninhalt am größten.