S 184

1) $2x^2 - 8x = 10 \quad | -10 \qquad 2x^2 - 8x - 10 = 0$ Vieta

$2 \cdot (x^2 - 4x - 5) = 2 \cdot (x-5)(x+1) \qquad \mathbb{L} = \{-1; 5\}$

2) $3x^2 = 9x - 30 \quad | -9x + 30 \qquad 3x^2 - 9x + 30 = 0 \quad | \cdot 1/3$

$x^2 - 3x + 10 = 0$ p-q-Formel

$x_{1,2} = 3/2 \pm \sqrt{(3/2)^2 - 10} = 3/2 \pm \sqrt{-7{,}75} \Rightarrow \mathbb{L} = \{\}$

S(-6|-1)

3) $1/4 x^2 + 3x + 8 = 1/4 \cdot (x^2 + 12x + 32) = 1/4 \cdot [(x+6)^2 - 6^2 + 32]$

$= 1/4 \cdot [(x+6)^2 - 4] = 1/4 \cdot (x+6)^2 - 1$

$1/4 \cdot [(x+6)^2 - 4] = 0 \quad | \cdot 4 / + 4$ Q.E

$(x+6)^2 = 4 \quad | \sqrt{\ }$

$x + 6 = \pm \sqrt{4} = \pm 2 \quad | -6$

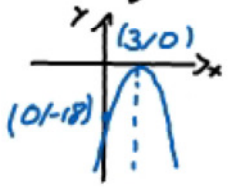
$x_1 = -8 \quad \cup \quad x_2 = -4 \qquad \mathbb{L} = \{-8; -4\}$

4) $f(x) = -2 \cdot x^2 + 12x - 18 = -2\,(x^2 - 6x + 9) = -2 \cdot (x-3)^2 + 0$

→ nach unten geöffnet und um den Faktor 2 gestreckt

→ $S = (3|0) = S_x \hat{=} HP$; $S_y = (0|-18)$

→ $x = 3$ ist Symmetrieachse



5) $g(x) = \frac{1}{2}x^2 + 10x + 32 = \frac{1}{2} \cdot (x^2 + 20x + 64)$

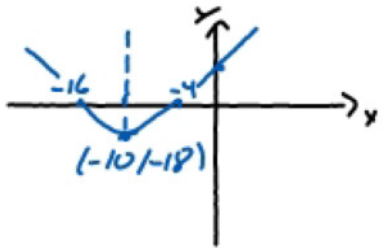
$= \frac{1}{2} \cdot (x+16) \cdot (x+4)$

→ nach oben geöffnet und um den Faktor $\frac{1}{2}$ gestaucht

→ $S_{x_1} = (-16|0)$; $S_{x_2} = (-4|0)$; $S_y = (0|32)$

→ Scheitelpunkt: $S(-10 \,|\, f(-10)) = S = (-10|-18) \hat{=} TP$

→ $x = -10$ ist Symmetrieachse



6) $x^4 - 24x^2 = 25$ $\quad | - 25$

$x^4 - 24x^2 - 25 = 0$

$(x^2 - 25)(x^2 + 1) = 0$

$(x-5) \cdot (x+5)(x^2+1) = 0$ $\quad \Rightarrow \mathbb{L} = \{-5; 5\}$

7) $x^8 + 16 = 17x^4$ $\quad | - 17x^4$

$x^8 - 17x^4 + 16 = 0$

$z = x^4$ Substitution

$z^2 - 17z + 16 = 0$

$(z - 16)(z - 1) = 0$

$z_1 = 16 \quad \vee \quad z_2 = 1$

$x = \pm\sqrt[4]{z}$ Resubstitution

$x_{1/2} = \pm\sqrt[4]{16}$; $x_{3/4} = \pm\sqrt[4]{1}$ $\quad \Rightarrow \mathbb{L} = \{\pm 1; \pm 2\}$

Ungleichungen ($>, <, \geq, \leq$)

"Punktrechnung mit negativen Ausdrücken ändert das U-Zeichen"

$3x - 4 > x + 2 \quad |+4 - x$

$2x > 6 \quad |\cdot 1/2$

$x > 3$

$2x - 5 < 4x + 3 \quad |-4x + 5$

$-2x < 8 \quad |\cdot(-1/2)$!

$x > -4$

Betrag $|\heartsuit| \geq 0$

$f(x) = |\frac{2}{3}x - 2|$

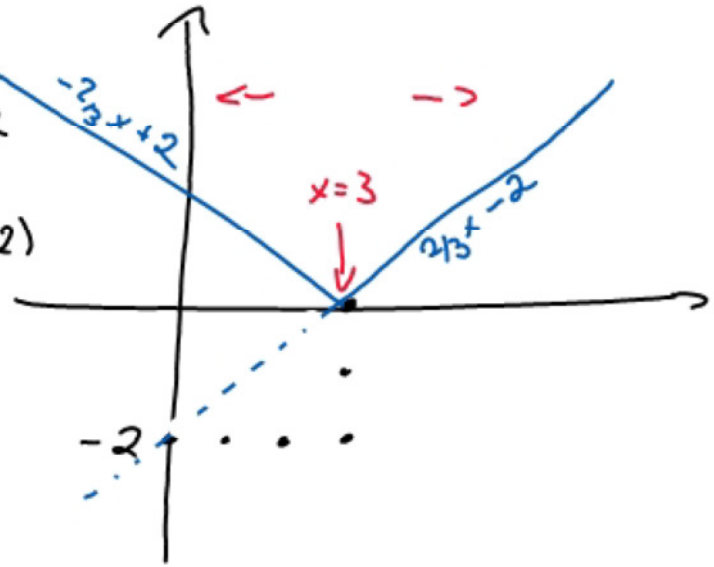
$x \geq 3: \quad \frac{2}{3}x - 2$

$x < 3: \quad -(\frac{2}{3}x - 2)$

$-\frac{2}{3}x + 2$

$y = m \cdot x + b$

P ⇕ R →



S 188

4) $|3-x| < 2$

F	$x \geq 3$ $\quad \delta^-$	$x < 3$ $\quad \delta^+$
R	$-(3-x) < 2$	$3-x < 2$
	$-3+x < 2$	$-x < -1$
	$x < 5$	$x > 1$
E	$x \geq 3 \wedge x < 5$	$x < 3 \wedge x > 1$
P	$x = 4$: ✓	$x = 2$: ✓
	$\lvert 3-4 \rvert = 1 < 2$	$\lvert 3-2 \rvert = 1 < 2$

L $\quad \mathbb{L} = \{x \in \mathbb{R} \mid x > 1 \wedge x < 5$

$= x \in]1;5[$

$= x \in (1;5)$

5) $|4x-12| > 8$

$x \geq 3$ $\quad \delta^+$	$x < 3$ $\quad \delta^-$	F
$4x-12 > 8$	$-(4x-12) > 8$	R
$4x > 20$	$-4x+12 > 8$	
$x > 5$	$-4x > -4$	
	$x < 1$	
$x > 5$	$x < 1$	E
$x = 6$:	$x = 0$	P
$\lvert 24-12 \rvert = 12 > 8$	$\lvert 0-12 \rvert = 12 < 8$	

$\mathbb{L} = \{x \in \mathbb{R} \mid x > 5 \vee x < 1\}$ L

S 191

1) $\frac{2x-5}{4-2x} > \frac{1}{2}$, $\mathbb{D} = x \in \mathbb{R} \setminus \{2\}$

F	$x > 2$ δ^-	$x < 2$ δ^+
R	$2x-5 < \frac{1}{2}(4-2x)$	$2x-5 > \frac{1}{2}(4-2x)$
	$2x-5 < 2-x$	
	$3x < 7$	$-\,\shortparallel\,-$
	$x < \frac{7}{3}$	$x > \frac{7}{3}$
E	$x > 2 \wedge x < \frac{7}{3}$	$x < 2 \vee x > \frac{7}{3}$
P	$x = \frac{9}{4}$: ✓	$x = 0$ ↯
	$\frac{2 \cdot \frac{9}{4} - 5}{4 - 2 \cdot \frac{9}{4}} = 1 > \frac{1}{2}$	$\frac{0-5}{4-0} = -\frac{5}{4} > \frac{1}{2}$

L $\mathbb{L} = \{x \in \mathbb{R} \mid x > 2 \wedge x < \frac{7}{3}\}$

$= x \in]2; 2\frac{1}{3}[$

$= x \in (2; 2\frac{1}{3})$

2) $\frac{2x+1}{1+x} \geq 3$; $\mathbb{D} = x \in \mathbb{R} \setminus \{-1\}$

F	$x > -1$ δ^+	$x < -1$ δ^-
R	$2x+1 \geq 3 \cdot (1+x)$	$2x+1 \leq 3 \cdot (1+x)$
	$2x+1 \geq 3+3x$	
	$-x \geq 2$	$-\,\shortparallel\,-$
	$x \leq -2$	$x \geq -2$
E	$x > -1 \vee x \leq -2$	$x < -1 \wedge x \geq -2$
P	$x = 0$: ↯	$x = -1{,}5$ ✓
	$\frac{2 \cdot 0 + 1}{1+0} = 1 \geq 3$	$\frac{2(-1{,}5)+1}{1+(-1{,}5)} = \frac{-2}{-\frac{1}{2}} = 4 \geq 3$

L $\mathbb{L} = \{x \in \mathbb{R} \mid x \geq -2 \wedge x < -1\}$

$= x \in [-2; -1[$

$= x \in [-2; -1)$

5) $x^3 + x + 6 > 4x^2 \qquad |-4x^2$

$x^3 - 4x^2 + x + 6 > 0 \qquad x = -1$

$(x^3 - 4x^2 + x + 6)(x+1) = x^2 - 5x + 6$ — R

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

$-5x^2 + x + 6$

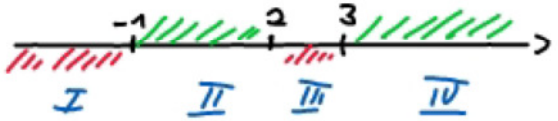
$-(-5x^2 - 5x)$

$6x + 6$

$-(6x + 6)$

$(x-3)(x-2)$

$(x+1)\cdot(x-2)\cdot(x-3) > 0$ — E



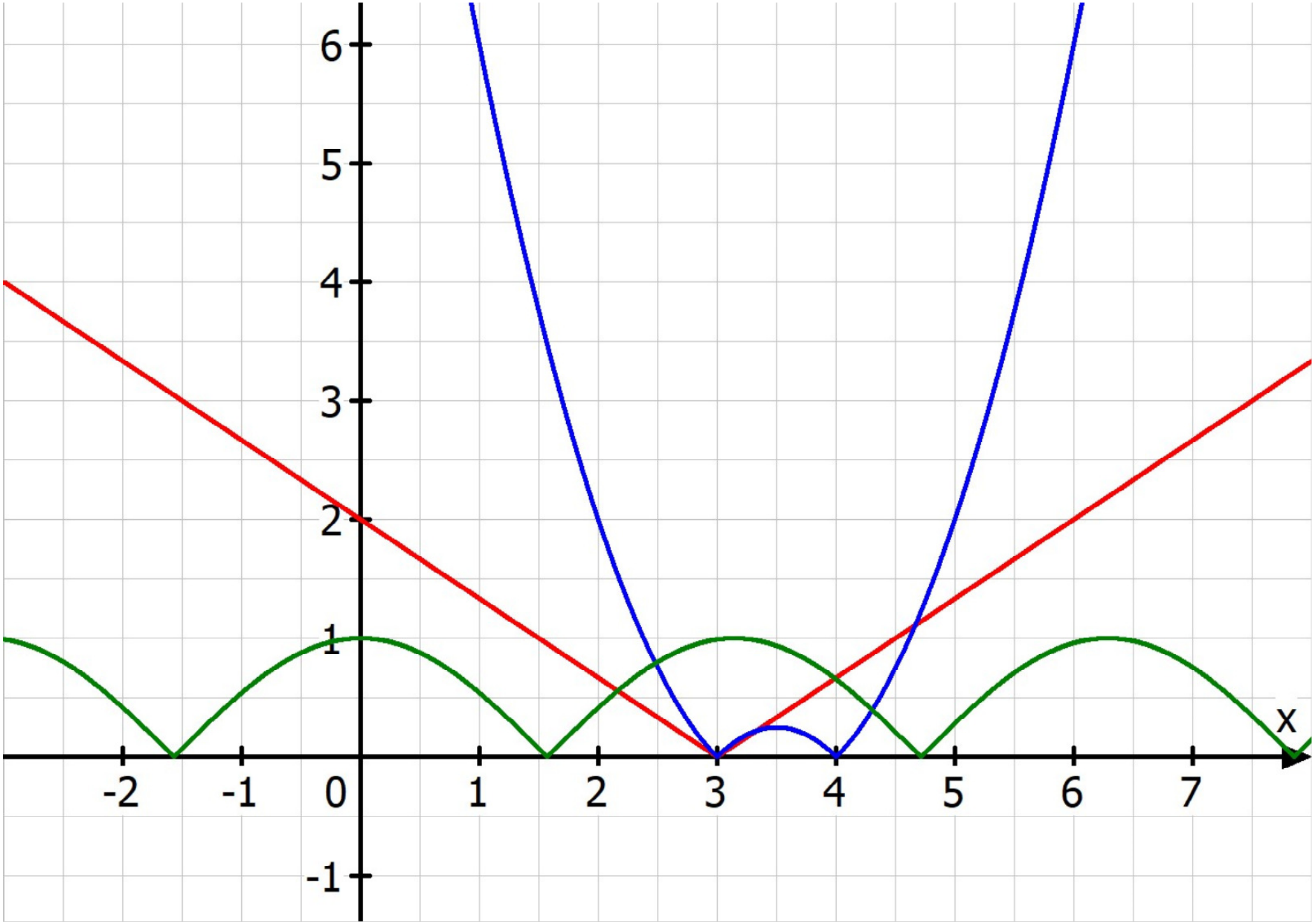
I $x = -2 : (-)\cdot(-)\cdot(-) < 0$ ✗ — P

II $x = 0 : (+)\cdot(-)\cdot(-) > 0$ ✓

III $x = 2{,}5 : (+)\cdot(+)\cdot(-) < 0$ ✗

IV $x = 42 : (+)\cdot(+)\cdot(+) > 0$ ✓

$\mathbb{L} = \{ x \in \mathbb{R} \mid (x > -1 \wedge x < 2) \vee x > 3 \}$ — L


6
5
4
3
2
1
-1
-2
-1
0
1
2
3
4
5
6
7
x