

## Session 1

### Aufgabe 1

$$(a) \log_2 64 = 6$$

$$(b) \log_{10} 0,0001 = \log_{10} 10^{-4} = -4$$

$$(c) \ln \frac{e^{2x-3}}{e^{-5}} = \ln e^{2x-3} - \ln e^{-5} \\ = 2x-3 - (-5) = 2x+2 = 2(x+1)$$

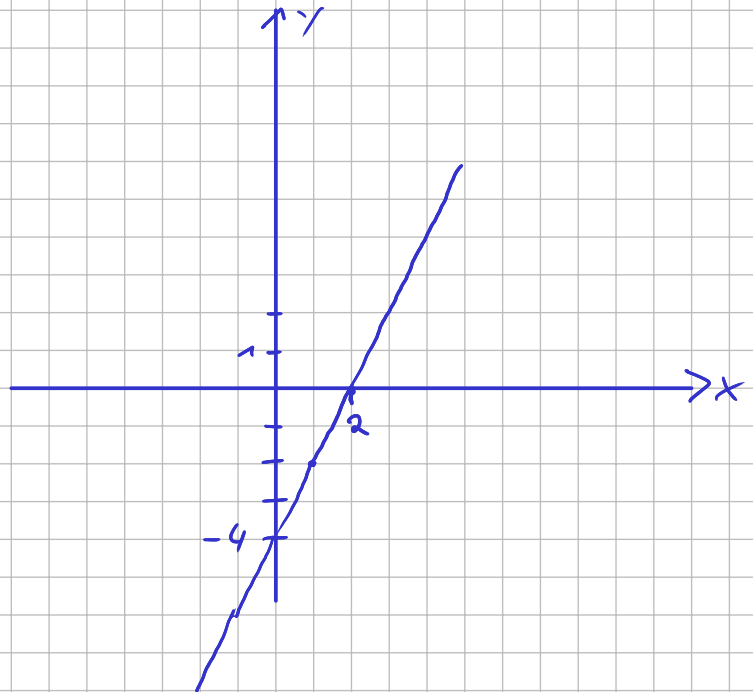
$$(d) \log_{10} \left( 100 \cdot \frac{u^2 v}{w^3} \right) = \log_{10} 100 + \log \frac{u^2 v}{w^3} \\ = 2 + \log u^2 v - \log w^3 \\ = 2 + \log u^2 + \log v - \log w^3 \\ = 2 + 2 \log u + \log v - 3 \log w$$

$$(e) \ln(e^5 + e^2) = \ln(e^2(e^3 + 1)) \\ = \ln(e^2) + \ln(e^3 + 1) \\ = 2 + \ln(e^3 + 1)$$

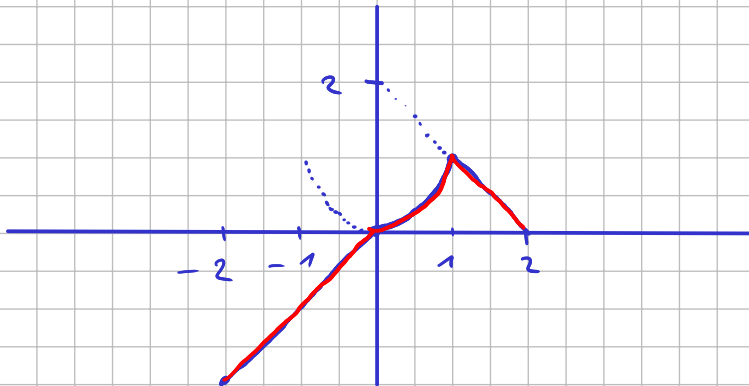
$$\begin{aligned}
 (f) \quad & \frac{1}{4} \log_{10} a^{4m} - (m+2) \log_{10} a \\
 &= \frac{1}{4} \cdot 4m \cdot \log_{10} a - (m+2) \log_{10} a \\
 &= \log_{10}(a) \cdot (m - (m+2)) = -2 \log_{10} a
 \end{aligned}$$

## Aufgabe 2

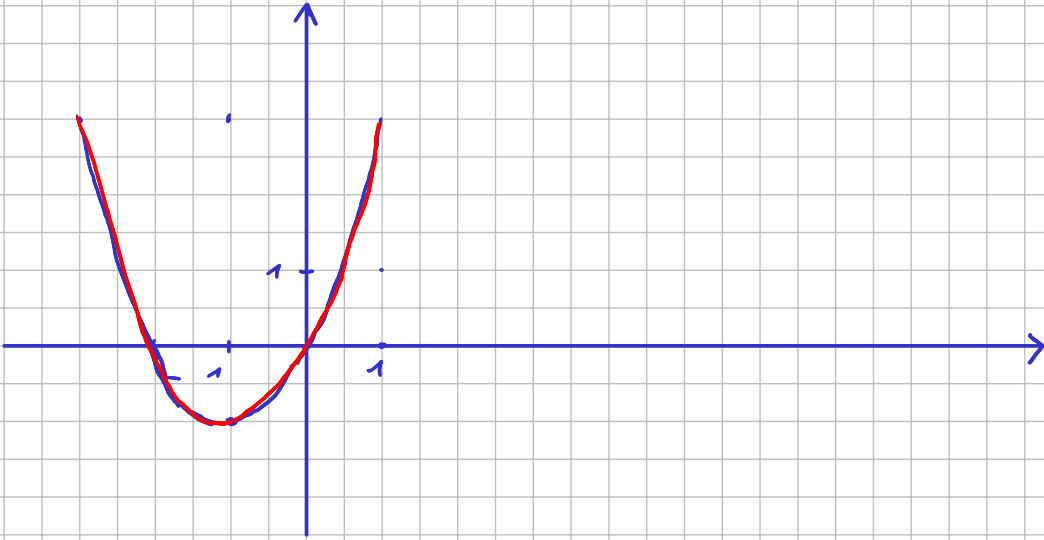
(a)  $f(x) = -4 + 2x$



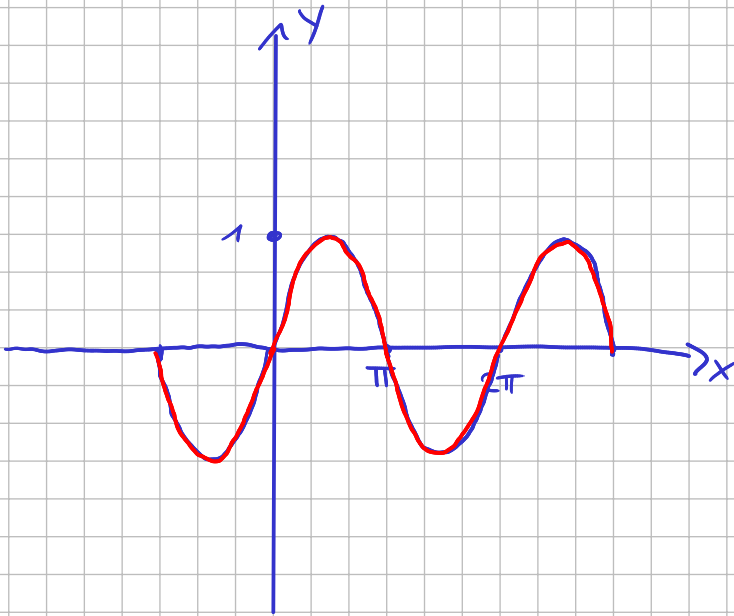
(b)  $f(x) = \begin{cases} x & -2 \leq x \leq 0 \\ x^2 & 0 < x \leq 1 \\ 2-x & 1 < x \leq 2 \end{cases}$



(c)  $f(x) = (x+1)^2 - 1$

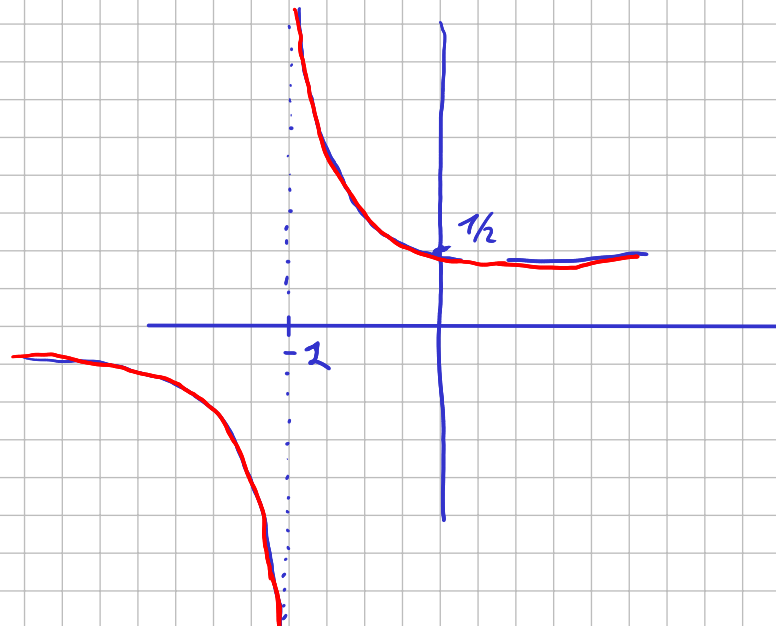


(d)  $f(x) = \sin(x + 2\pi)$

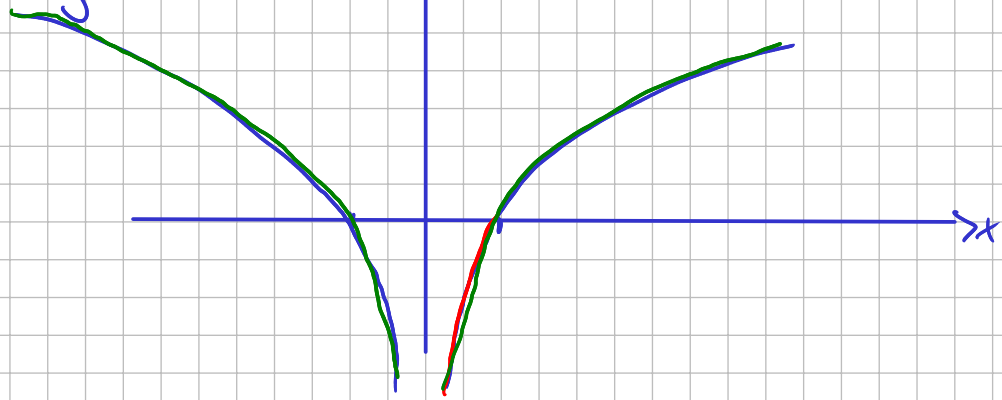


Aufgabe 3

•  $\frac{1}{x+2}$  rot



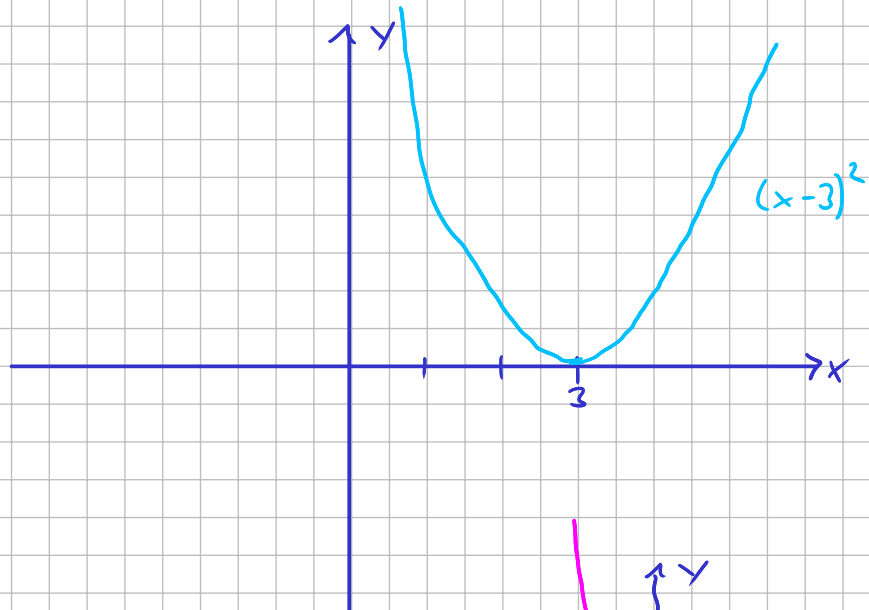
•  $\ln(x^2) \rightarrow$  grün



•  $x^2 - 6x + 9$   
 $= (x-3)^2$

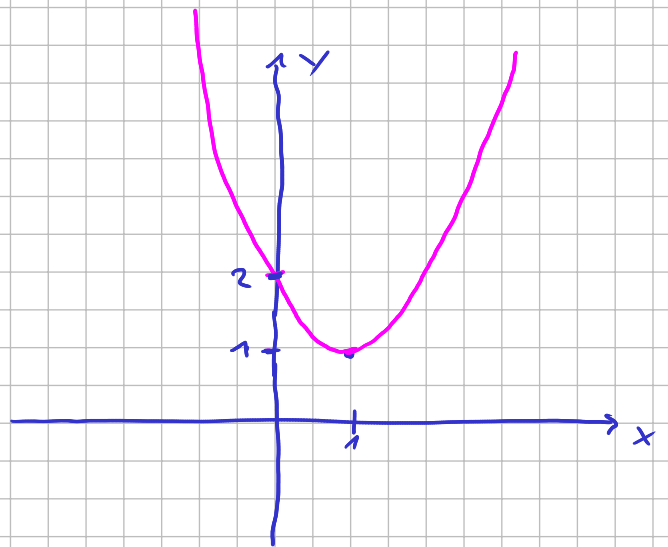
Nst.  $x_{1,2} = \frac{6 \pm \sqrt{36 - 36}}{2}$   
 $= 3$

$\rightarrow$  türkis



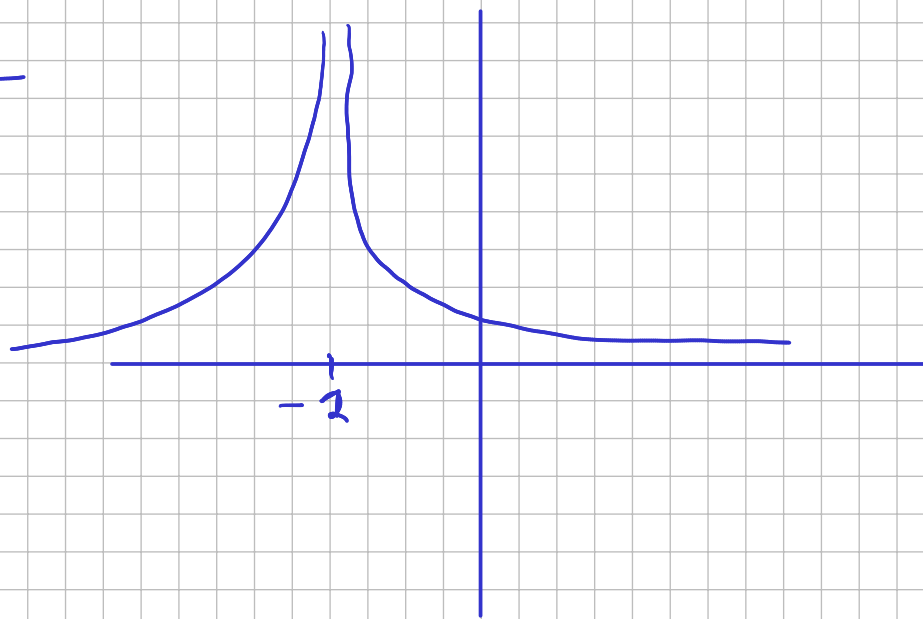
$f(x) = x^2 - 2x + 2 = (x-1)^2 + 1$

$\rightarrow$  rosa



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

→ blau



#### Aufgabe 4

(i)  $2(x-3) = 3(x+1)$

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

$$\Leftrightarrow 2x - 6 = 3x + 3 \quad | -2x - 14$$

$$\Leftrightarrow -9 = x$$

$$\mathbb{L} = \{-9\}$$

(ii)  $(x-2)(x-1) = 0$

$$\mathbb{D} = \mathbb{R}, \quad \mathbb{L} = \{2, 1\}$$

(iii)  $2x^2 + 18x + 10 = 6x$

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

$$\Leftrightarrow 2x^2 + 12x + 10 = 0$$

$$\Leftrightarrow x^2 + 6x + 5 = 0$$

$$\Leftrightarrow x_{1/2} = \frac{-6 \pm \sqrt{36 - 20}}{2}$$

$$= \frac{-6 \pm 4}{2} = -3 \pm 2$$

$$= -5, -1$$

$$\mathbb{L} = \{-5, -1\}$$

(iv)  $(x^2 - 1)(x^2 + 3x) = 0$

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

$$\Leftrightarrow (x-1)(x+1) \cdot x(x+3) = 0$$

$$\Rightarrow \mathbb{L} = \{1, -1, 0, -3\}$$

$$(v) \frac{3x}{x-2} = \frac{2x+7}{x+3} + \frac{6}{x-2}$$

$$\mathbb{D} = \mathbb{R} - \{2, -3\}$$

$$\frac{3x(x+3)}{(x-2)(x+3)} = \frac{(2x+7)(x-2)}{(x+3)(x-2)} + \frac{6(x+3)}{(x-2)(x+3)}$$

$$\Leftrightarrow \frac{3x^2 + 9x}{(x-2)(x+3)} = \frac{2x^2 - 4x + 7x - 14 + 6x + 18}{(x+3)(x-2)}$$

$$\Rightarrow 3x^2 + \cancel{9x} = 2x^2 + \cancel{3x} + 4 + \cancel{6x} \quad | -2x^2 \quad | -4$$

$$\Leftrightarrow x^2 - 4 = 0 \quad \Leftrightarrow x^2 = 4$$

$$\Leftrightarrow x_{1,2} = \pm 2 \quad +2 \notin \mathbb{D} \Rightarrow \mathbb{L} = \{-2\}$$

$$(vi) 3 \cdot 5^x = 7^{x-1} \quad | \ln \quad \mathbb{D} = \mathbb{R}$$

$$\ln 3 \cdot 5^x = \ln 7^{x-1}$$

$$\ln 3 + x \cdot \ln 5 = (\ln 7)(x-1) \quad | -x \cdot \ln 5$$

$$\Leftrightarrow \ln(3) = \ln 7 \cdot x - \ln 5 \cdot x - \ln(7) \quad | + \ln 7$$

$$\Leftrightarrow \ln(3) + \ln(7) = x(\ln 7 - \ln 5)$$

$$\Leftrightarrow x = \frac{\ln(3) + \ln(7)}{\ln(7) - \ln 5} \approx 9,048$$

$$(vii) 1 - \sqrt{2x-3} = x \quad \mathbb{D} = \left[\frac{3}{2}, \infty\right)$$

$$\Leftrightarrow \sqrt{2x-3} = 1-x \quad | ( )^2 \quad \begin{cases} 2x-3 \geq 0 \\ \Rightarrow 2x \geq +3 \\ \Rightarrow x \geq \frac{3}{2} \end{cases}$$

keine Äquivalenzumf.

$$\Rightarrow 2x-3 = 1-2x+x^2$$

$$\Leftrightarrow x^2 - 4x + 4 = 0$$

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

$$\Leftrightarrow (x-2)^2 = 0$$

$x=2$  erfüllt Gleichung nicht

$$(viii) \quad \overset{x \geq \frac{2}{3}}{\ln(3x-2)} - 2 \overset{x \geq \frac{3}{2}}{\ln(2x-3)} = 0 \quad \mathbb{D} = \left[\frac{3}{2}, \infty\right)$$

$$\Leftrightarrow \ln(3x-2) = 2 \ln(2x-3) \quad |e^{(\cdot)}$$

$$\Rightarrow 3x-2 = (2x-3)^2$$

$$\Leftrightarrow 3x-2 = 4x^2 - 12x + 9$$

$$\Leftrightarrow 0 = 4x^2 - 15x + 11$$

$$\begin{aligned} x_{1/2} &= \frac{15 \pm \sqrt{15^2 - 4 \cdot 4 \cdot 11}}{8} = \frac{15}{8} \pm \frac{\sqrt{49}}{8} \\ &= \frac{15}{8} \pm \frac{7}{8} = 1 \pm \frac{22}{8} = \frac{11}{4} \end{aligned}$$

$$1 \notin \mathbb{D} \Rightarrow \mathbb{L} = \left\{ \frac{11}{4} \right\}$$