1) $2 + \frac{1}{x} - \frac{2}{3} - \frac{1}{4x} - \left(\frac{7}{12} + \frac{3}{4}\right)$ $\rightarrow \frac{3}{4x}$

2) $\dfrac{\frac{3a}{6} - 2 + \frac{5}{3a}}{\frac{18a}{6} - \frac{25}{a}}$ $\rightarrow \frac{3a-5}{18a+65}$

3) $z^3 + (6-2i)z^2 - 2i \cdot z \cdot (3-4i) = 0$ $\rightarrow z_1 = 0$, $z_2 = 1+i$, $z_3 = -7+i$

4) $\dfrac{9 \cdot (0{,}5\, x^7 y^{-7} z)^4}{5^4 \cdot (4\, x^{-7} y^3 z^{-2})^{-3}} : \dfrac{36 \cdot (2 x^7 y^5 z^{-4})^2}{16\,(3 \cdot x^4 \cdot y^3 z^{-4})^3}$ $\rightarrow \frac{2x^{10}}{z^6}$

5) $\dfrac{\sqrt[24]{a^{3n+7}}}{\sqrt{\sqrt[4]{a^{5-2n}}}} \cdot \left(\sqrt[44]{a^2}\right)^{5n-2}$ $\rightarrow a^5$

1) $$\frac{\overline{24x} + 12 - \overline{8x} - 3 - (\overline{7x} + \overline{9x})}{12x} = \frac{9}{12x} = \frac{3}{4x}$$

2) $$\frac{\frac{(3a)^2 - 6as + s^2}{3as}}{\frac{18a^2 - 2s^2}{as}} = \frac{(3a-s)^2}{3as} \cdot \frac{as}{2\cdot(3a-s)(3a+s)}$$

$$= \frac{3a-s}{6\cdot(3a+s)}$$

3) $$z\left(z^2 + \underbrace{(6-2i)}_{p}\cdot z + \underbrace{(-6i-8)}_{q}\right) = 0$$

$z_1 = 0$

$$z_{2/3} = -\frac{6-2i}{2} \pm \sqrt{(3-i)^2 - (-6i-8)}$$

$z_2 = -7+i$ $= -3+i \pm \sqrt{9 - 6i + i^2 + 6i + 8}$

$z_3 = 1+i$ $= -3+i \pm \sqrt{16}$

4)
$$\frac{9\cdot 2^{-4}x^{8}y^{-8}z^{4}}{5^{-4}\,2^{-6}x^{+6}y^{-9}z^{6}}\;\frac{16\,3^{3}x^{12}y^{9}z^{-12}}{36\,2^{2}x^{4}y^{10}z^{-8}}$$

$$\frac{2^{10}}{2^{9}}\;\frac{9\cdot 16\cdot 3^{3}2^{6}}{2^{4}\,5^{-4}\,36\,2^{2}}\;\frac{x^{8}z^{4}x^{12}y^{9}\;y^{9}z^{8}}{y^{8}z^{12}z^{6}x^{4}y^{10}y^{6}}$$

$$2^{2}\cdot\frac{x^{10}}{z^{6}}$$

5)
$$\frac{a^{\frac{3n+7}{2n}}}{a^{\frac{5-2n}{2n}}}\cdot a^{\frac{2\cdot(5n-2)}{4n}}=a^{\frac{3n+7-(5-2n)+5n-2}{2n}}$$

$$a^{\frac{10n}{2n}}=a^{5}$$

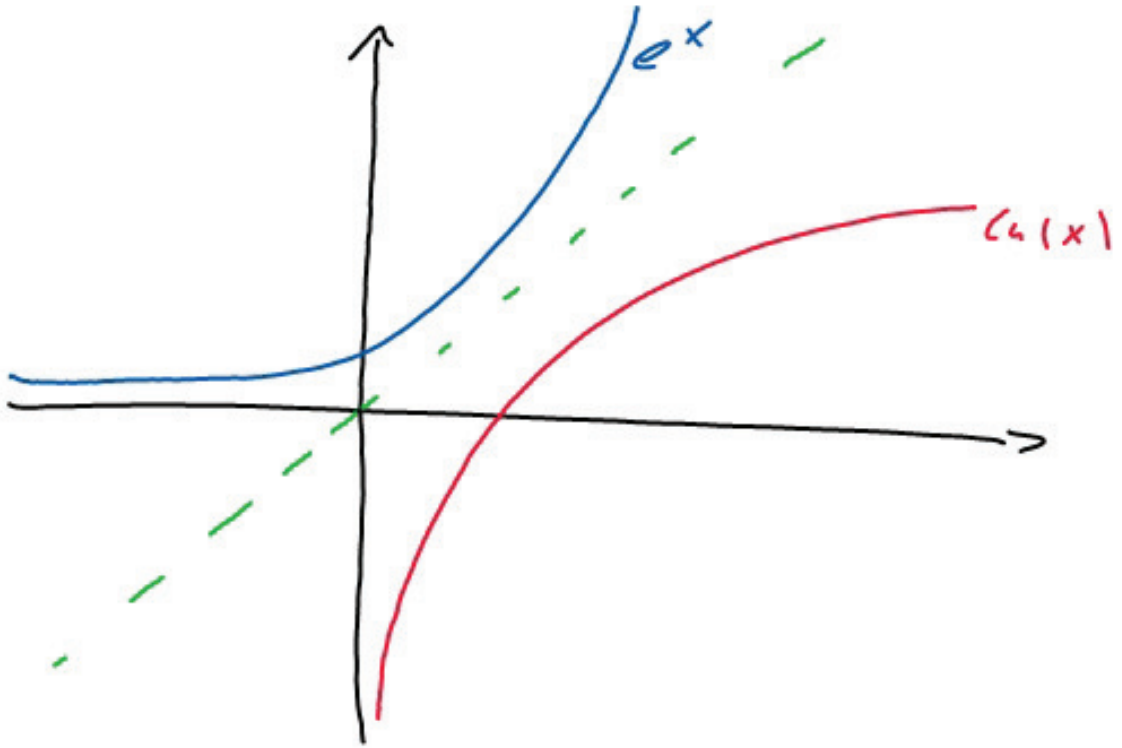
$\ln(0) = y \iff e^y = 0$

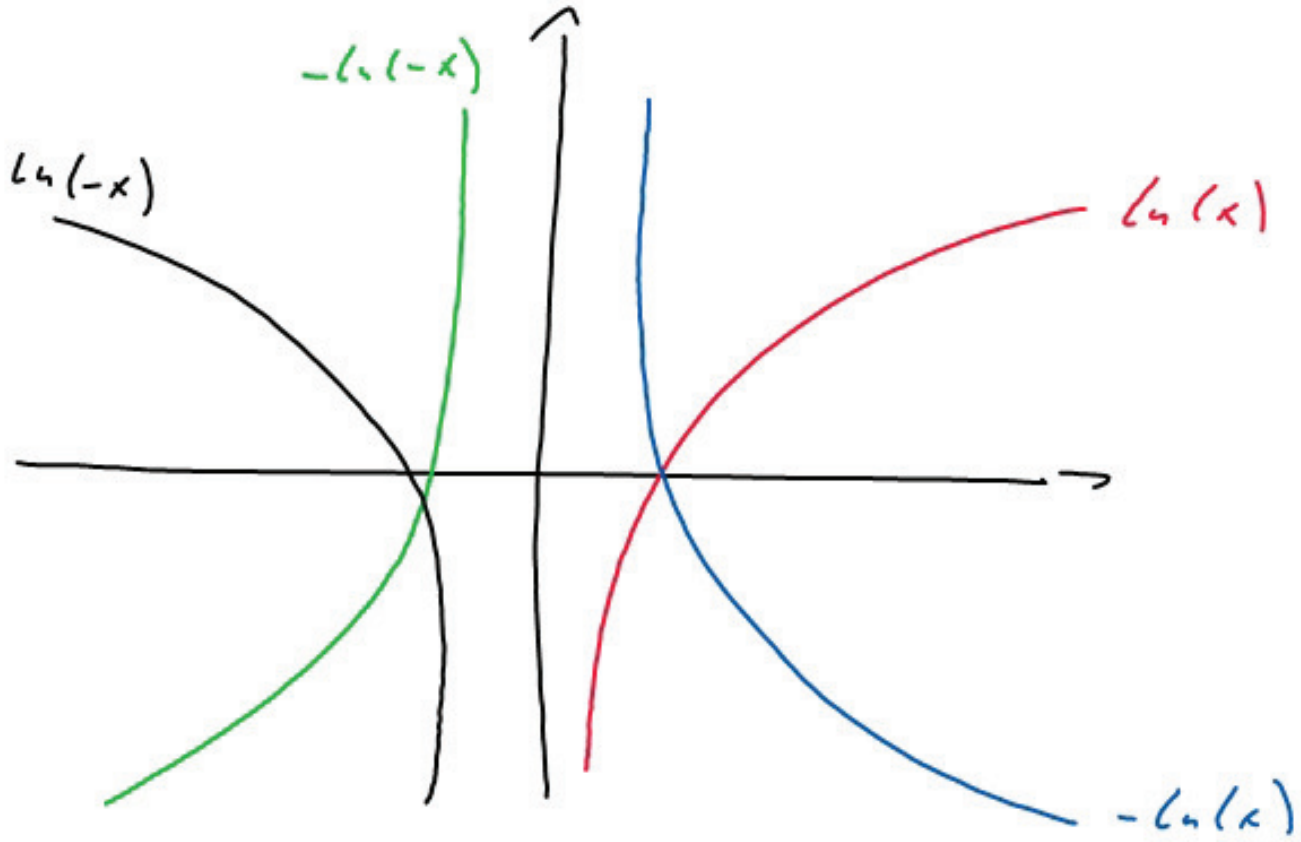
$\log(-4) = y \iff 2^y = -4$

$\frac{7}{x^2+1}$

$\ln(x^2+1)$

$\sqrt{x^2+1}$




$-\ln(-x)$
$\ln(-x)$
$\ln(x)$
$-\ln(x)$

$$2 \cdot \log x - \log 3 = \log 12 + 0{,}5 \cdot \log x^2$$

$$\log x^2 - \log 3 = \log 12 + \log (x^2)^{1/2}$$

$$\log \frac{x^2}{3} = \log 12 \cdot x \qquad | \; 10^x$$

$$x^2/3 = 12x \qquad | : x \cdot 3$$

$$x = 36$$

1) $3 \cdot \log(x-1) + \log(x+1) - \frac{1}{2} \cdot \log(x-1)^4$

$\log(x-1)^3 + \log(x+1) - \log[(x-1)^4]^{\frac{1}{2}}$

$\log \frac{(x-1)^3 \cdot (x+1)}{(x-1)^2} = \log[(x-1)\cdot(x+1)] = \log(x^2-1)$

2) $2\ln 2x - 3\ln 2 + 4 \cdot \ln\sqrt{x} + 2 \cdot \ln\left(\frac{4}{x^2}\right)$

$\ln(2x)^2 - \ln 2^3 + \ln|\sqrt{x}|^4 + \ln\left|\frac{4}{x^2}\right|^2$

$\ln \frac{4x^2 \; x^2 \; 4^2}{8 \quad x^4} = \ln 8$

5) $16^{\ld\sqrt{3}} + 1000^{\log 3} - \sqrt[4]{e}^{2\cdot\ln 25} - 2\cdot\ln\left(\frac{1}{e}\right)^2 - \lg\left(\frac{1}{100}\right) + 3\cdot\ld\left(\frac{1}{8}\right)$

Basistransformation

$2^{4\cdot\ld\sqrt{3}} + 10^{3\cdot\log 3} - e^{\frac{1}{4}\cdot 2\cdot\ln 25} - 2\cdot\ln e^{-2} - \lg 10^{-2} + 3\cdot\ld 2^{-3}$

log - Gesetze

$2^{\ld 3^2} + 10^{\lg 3^3} - e^{\ln(25)^{1/2}} - 2\cdot\ln e^{-2} - \lg 10^{-2} + 3\cdot\ld 2^{-3}$

Operation / Gegenoperation

$9 + 27 - 5 - 2\cdot(-2) - (-2) + 3\cdot(-3)$

$42 - 14 = 28$

1) $\log 10^{-2} - e^{\frac{1}{2}\ln 4} + 2^{2\ld 3} - 2\ld 2^{-2}$

$-2 \quad -2 \quad +9 \quad +4 \quad \to 9$

2) $10^{2\log 3} - \ln e^{-7} + \frac{1}{2}\ld 2^4 - e^{\ln 2^3}$

$9 \quad +2 \quad +7 \quad -8 \quad \to 5$

3) $2^{-3\ld 2} - 6\cdot \ln e^{-\frac{1}{3}} + \frac{1}{4}\ld 2^6 - \frac{1}{2}\log 10^{-3} + e^{\frac{1}{3}\ln 27}$

$\frac{1}{8} \quad +2 \quad +\underbrace{\frac{6}{4} + \frac{3}{2}}_{3} \quad +27^{\frac{1}{3}}$

$\frac{1}{8} \quad 2 \quad 3 \quad 3$

$8\frac{1}{8}$

4)

$$e^{-\frac{1}{2}\ln\frac{1}{9}} + 10^{2\log 4} - 2^{4\cdot\frac{1}{2}\cdot\operatorname{ld}4} + 2\log 10^{-3} - 3\ln e^{-3} + \frac{1}{4}\operatorname{ld}2^{-8}$$

$$3 + 16 - 16 - 6 + 9 - 2 \rightarrow 4$$

1) $3 \cdot \lg x - 4 \lg \frac{2}{x} - \frac{1}{3} \lg x^{12} = \frac{2}{3} \lg 27 + \frac{1}{2} \lg x^4 - 2 \lg 6$

$\lg x^3 - \lg \frac{16}{x^4} - \lg x^4 = \lg 9 + \lg x^2 - \lg 36$

$\lg \frac{x^3}{\frac{16}{x^4} \quad x^4} = \lg \frac{9x^2}{36}$ $\uparrow 10^x$

$\frac{x^3}{16} = \frac{x^2}{4}$ $\quad | : x^2 \cdot 16$

$x = 4$

$x^2 - 5x + 6 = 0$

$a+b$ $\quad$ $a \cdot b$

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

$x_1 = 2 \quad \vee \quad x_2 = 3$

$0{,}5 \cdot (-0{,}5)$

$S(2{,}5 \mid f(2{,}5))$

$S(2{,}5 \mid -0{,}25)$

I 1) $2x^2 - 8x - 10 = 2 \cdot (x^2 - 4x - 5) = 2 \cdot (x-5)(x+1) = 0$

$x_1 = 5 \quad \vee \quad x_2 = -1$

2) $3x^2 - 9x + 30 = 3 \cdot (x^2 - 3x + 10) = 0$

$x_{1/2} = 3/2 \pm \sqrt{\underbrace{9/4 - 10}_{<0}}$ $\Big\} \; \mathbb{L} = \{\}$

3) $1/4\, x^2 + 3x + 8 = 1/4 (x^2 + 12x + 32) = 0$

$= 1/4 \cdot \left[(x+6)^2 - 36 + 32 \right] = 0$

$= 1/4 \cdot \left[\underbrace{(x+6)^2}_{x+6 = \pm 2} - 4 \right] = 0$

$x_1 = -8$

$x_2 = -4$

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

-> nach unten geöffnet (steiler)
-> $S_y (0 | -18)$
-> $S_x (3 | 0)$ -> Scheitelpunkt (HP)
-> $x = 3$ Symmetrieachse

5) $g(x) = \frac{1}{2}(x^2 + 70x + 64) = \frac{1}{2}(x+4)(x+16)$

$x_1 = -4 \quad x_2 = -16$

-> nach oben geöffnet (flacher)
-> $S_y (0 | 32)$
-> $S_{x1} (-4 | 0)$; $S_{x2} (-16 | 0)$
-> Scheitelpunkt $S(-10 | f(-10)) = (-10 | -18)$
-> Symmetrieachse bei $x = -10$

III 7) $x^4 - 24x^2 - 25 = 0$

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

$\neq 0$

$x_{1/2} = \pm 5$

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

$(x^4 - 1)(x^4 - 16) = 0$

$x_{1/2} = \pm 1 \quad \vee \quad x_{3/4} = \pm 2$

$x = 2 \cdot \sqrt{6-x} + 6$ | -6

$x - 6 = 2 \cdot \sqrt{6-x}$ | $()^2$

$(x-6)^2 = 4 \cdot (6-x)$ | $-24 + 4x$

$x^2 - 12x + 36 - 24 + 4x = 0$ | $:1$

$x^2 - 8x + 12 = 0$ | Vieta

$(x-2)(x-6) = 0$

$x_1 = 2 \quad \vee \quad x_2 = 6$

$$\frac{x^2+4}{29+x^2} = \frac{x^2}{2\cdot(7+x^2)} \quad | \ (29+x^2)\cdot(4+2x^2)$$

$$(x^2+4)\,|\,(2x^2+4) = x^2\cdot(x^2+29)$$

$$2x^4+8x^2+4x^2+16 = x^4+29x^2 \qquad | -x^4-29x^2$$

$$x^4-17x^2+16 = 0$$

$$(x^2-16)(x^2-1) = 0$$

$$x_{1/2} = \pm 4 \quad \vee \quad x_{3/4} = \pm 1$$

$|\underbrace{4x - 12}_{x=3}| > 8$

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

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

$$\frac{x \cdot (3+2x)}{6-2x} > 1-x \qquad | \cdot (6-2x)$$

$x > 3$: $6-2x < 0$	$x < 3$: $6-2x > 0$	F
$3x + 2x^2 < (1-x)\cdot(6-2x)$ $2x^2 + 3x < 6 - 6x - 2x + 2x^2$ $11x < 6$ $x < 6/11$	$3x + 2x^2 > (1-x)(6-2x)$ $\vdots$ $x > 6/11$	R
$x > 3 \vee x < 6/11$	$x < 3 \wedge x > 6/11$	E
$x = 4$: $\frac{4\cdot(3+8)}{6-8} > 1-4$ $\frac{44}{-2} = -22 > -3$ ✗	$x = 1$: $\frac{1\cdot(3+2)}{6-2} > 0$ $5/4 > 0$ ✓	P

$$\mathbb{L} = \{x \in \mathbb{R} \mid x < 3 \wedge x > 6/11\}$$ L

5) $x^3 - 4x^2 + x + 6 > 0$

$(x^3 - 4x^2 + x + 6)(x-2) = x^2 - 2x - 3$

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

$-2x^2 + x + 6$

$-(-2x^2 + 4x)$

$-3x + 6$

$-(-3x + 6)$

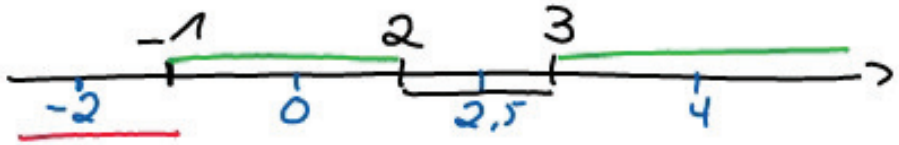
0

$x^2 - 2x - 3$

$-$

$(x-3)(x+1)$

$(x+1) \cdot (x-2) \cdot (x-3) > 0$



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

$x = -2$: $(-) \cdot (-) \cdot (-) < 0$

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

$x = 2{,}1$: $(+) \cdot (+) \cdot (-) < 0$

$x = 4$: $(+) \cdot (+) \cdot (+) > 0$