S 165

1) $6\cdot\ln\sqrt[3]{e^2} - \frac{8}{e^{2\ln 0,5}} - \left(\frac{1}{2}e^{\ln 3^2} - \ln\frac{1}{\sqrt{e}}\right) + \frac{8}{\ln e^2} + e^{2\ln 3}$

$\ln(e^{2/3})^6 - 8e^{\ln(1/2)^{-2}} - \left(\frac{1}{2}\cdot 3^2 - \ln e^{-1/2}\right) + \frac{8}{2} + e^{\ln 3^2}$

$4 - 32 - \left(\frac{9}{2} + \frac{1}{2}\right) + 4 + 9 = -20$

2) $3\ln e^5 - 2\cdot\left(e^{2\ln 2} + \ln\frac{1}{\sqrt[4]{e}}\right) + \frac{10}{e^{\ln\sqrt{4}}} + 0,5\cdot e^{\ln 3}$

$\ln(e^5)^3 - 2\cdot\left(e^{\ln 2^2} + \ln e^{-1/4}\right) + \frac{10}{\sqrt{4}} + \frac{1}{2}\cdot 3$

$15 - 2\cdot\left(4 - \frac{1}{4}\right) + 5 + \frac{3}{2} = 14$

3) $\frac{1}{6}\cdot \mathrm{ld}\,2^3 + 3\cdot e^{2\ln 0,5} - \lg\sqrt{10} + 4\cdot\left(2^{4\,\mathrm{ld}\frac{1}{2}} - 8\cdot\ln\frac{1}{\sqrt{e}}\right) - 4\cdot 10^{\frac{1}{4}\lg 256}$

$\frac{1}{6}\cdot 3 + 3\cdot e^{\ln(1/2)^2} - \lg 10^{1/2} + 4\cdot\left(2^{\mathrm{ld}(1/2)^4} - 8\cdot\ln e^{-1/2}\right) - 4\cdot 10^{\lg(256)^{1/4}}$

$\frac{1}{2} + 3\cdot\frac{1}{4} - \frac{1}{2} + 4\cdot\left(\frac{1}{16} - 8\left(-\frac{1}{2}\right)\right) - 4\cdot 4$

$\frac{1}{2} + \frac{3}{4} - \frac{1}{2} + \frac{1}{4} + 16 - 16 = 1$

4) $\frac{2}{3}\cdot\left(\lg 1000 - \frac{1}{2}\right) - \frac{2}{e^{\ln 0,5}} + 2^{3+\operatorname{ld}3} - \left(10^2\right)^{\lg 3} + \ln\left(\frac{1}{\sqrt[3]{e}}\right)^2 - 4\operatorname{ld}\sqrt{2}$

$$\frac{2}{3}\cdot\left(\lg 10^3 - \frac{1}{2}\right) - \frac{2}{\frac{1}{2}} + 2^3\cdot 2^{\operatorname{ld}3} - 10^{\lg 3^2} + \ln e^{-\frac{2}{3}} - \operatorname{ld}\left(2^{\frac{1}{2}}\right)^4$$

$$2 - \frac{1}{3} - 4 + 8\cdot 3 - 9 - \frac{2}{3} - 2 = 10$$

S169

I.1) $3\cdot\lg x - 4\cdot\lg\frac{2}{x} - \frac{1}{3}\cdot\lg\left(x^2\right)^6 = \frac{2}{3}\lg 27 + \frac{1}{2}\lg x^4 - 2\lg 6$

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

$$\lg\frac{x^3}{\frac{2^4}{\cancel{x^4}}\cdot\cancel{x^4}} = \lg\frac{3^2\,x^2}{6^2} \qquad \mid\ 10^x$$

$$\frac{1}{16}x^3 = \frac{\cancel{9}^{1}}{\cancel{36}_{4}}\,x^2 \qquad \mid :x^2\cdot 16$$

$$x = 4 \qquad \mathbb{D} = x\in\mathbb{R}^{>0}$$

$$\Rightarrow \mathbb{L} = \{4\}$$

S 169

I.2) $3\cdot\ln 4 - 0{,}5\ln {}^{16}/_{x^4} + 2\ln 8 = 1{,}5\ln x^4 - 8\ln\sqrt[4]{{}^1/_x} - 2\cdot\ln {}^1/_x$

$$\ln 4^3 - \ln\left({}^{16}/_{x^4}\right)^{1/2} + \ln 8^2 = \ln\left(x^4\right)^{3/2} - \ln\left(x^{-1/4}\right)^8 - \ln\left({}^1/_x\right)^2$$

$$\ln\frac{4^3\cdot 8^2}{4/x^2} = \ln\frac{x^6}{x^{-2}\,1/x^2} \quad \Big|\ \uparrow e^x$$

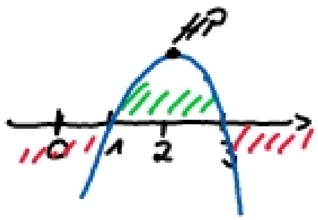
$$4^2\cdot 8^2\cdot x^2 = 4^2\cdot x^8 \quad \Big|\ : 4^2\ : x^2$$

$$\frac{4^2\cdot 8^2}{4^2} = x^6 \quad \Leftrightarrow \quad 8^2 = (2^3)^2 = 2^6 = x^6$$

$$x = 2 \qquad \mathbb{D} = x\in\mathbb{R}^{>0} \qquad \mathbb{L} = \{2\}$$

II. 3) $f(x) = {}^2/_5\cdot\ln(4x-3-x^2) = {}^2/_5\cdot\ln(-(x^2-4x+3))$

$= {}^2/_5\cdot\ln(-\underbrace{(x-3)(x-1)}))$



$$\lim_{x\to 1^+} f(x) = [{}^2/_5\cdot\ln(0^+)] = -\infty$$

$x=2: -(2-3)(2-1) > 0$

$x=0: -(0-3)(0-1) < 0$

$x=4: -(4-3)(4-1) < 0$

$$f(2) = {}^2/_5\cdot\ln(1) = 0$$

$$\mathbb{W} = y\in\mathbb{R}^{\le 0}$$

$$\mathbb{D} = x\in]1;3[= x\in(1;3)$$

Ableitung

$$f(x) = a \cdot x^n \;\rightarrow\; f'(x) = a \cdot n \cdot x^{n-1}$$

$$f(x) = \tfrac{1}{2} \cdot x^4 \;\rightarrow\; f'(x) = \tfrac{1}{2}\, 4 \cdot x^{4-1} = 2 \cdot x^3$$

$$f(x) = 12 \cdot \sqrt[3]{x^2} = 12 \cdot x^{2/3} \;\rightarrow\; f'(x) = 12 \cdot \tfrac{2}{3} \cdot x^{2/3-1}$$

$$= 8 \cdot x^{-1/3} = 8 \cdot \tfrac{1}{\sqrt[3]{x}}$$

Kettenregel

Potenz:

$$f(x) = \heartsuit^n \;\rightarrow\; f'(x) = n \cdot \heartsuit^{n-1} \cdot \heartsuit'$$

$$f(x) = (3x-4)^4 \;\rightarrow\; f'(x) = 4 \cdot (3x-4)^{4-1} \cdot (3x-4)'$$

$$= 12 \cdot (3x-4)^3$$

$$f(x) = 2 \cdot x^5 \;\rightarrow\; f'(x) = 2 \cdot 5 \cdot x^4 \cdot (x)' = 10x^4$$

Exponential:

$$f(x) = e^{\heartsuit} \rightarrow f'(x) = e^{\heartsuit} \cdot \heartsuit'$$

$$f(x) = e^{7-x^4} \rightarrow f'(x) = e^{7-x^4} \cdot (-4x^3)$$

Trigonometrie

$$f(x) = \sin(\heartsuit) \rightarrow f'(x) = \cos(\heartsuit) \cdot \heartsuit'$$

$$f(x) = \cos(\heartsuit) \rightarrow f'(x) = -\sin(\heartsuit) \cdot \heartsuit'$$

$$f(x) = \sin(x^2-3x) \rightarrow f'(x) = \cos(x^2-3x) \cdot (2x-3)$$

Logarithmus

$$f(x) = \ln \heartsuit \rightarrow f'(x) = \frac{1}{\heartsuit} \cdot \heartsuit'$$

$$f(x) = \ln(4-7x) \rightarrow f'(x) = \frac{1}{4-7x} \cdot (-7)$$

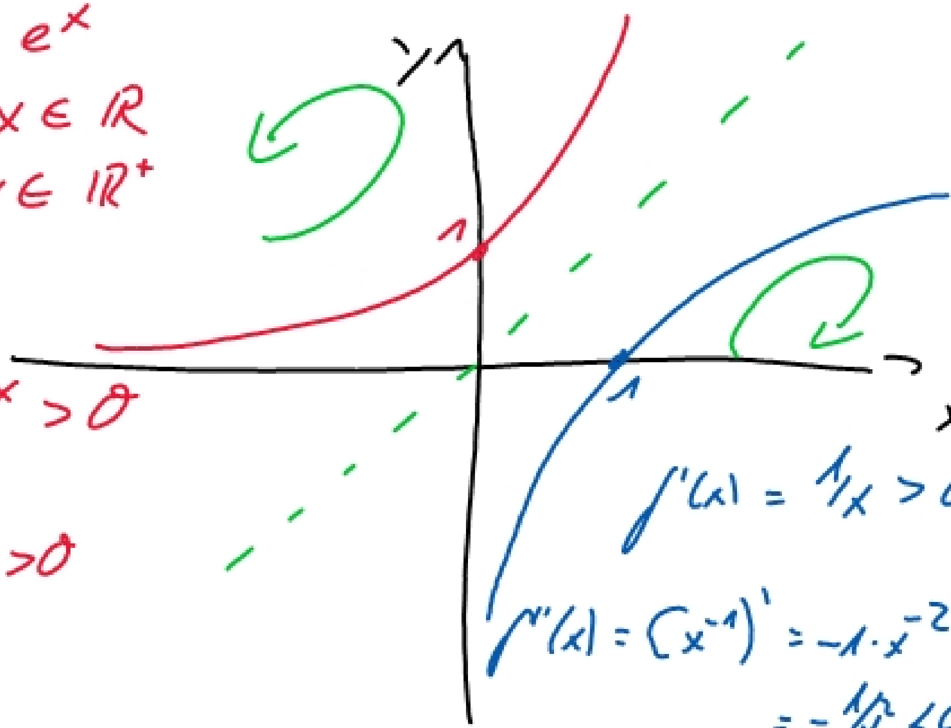
$f(x) = e^x$

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

$\mathbb{W} = y \in \mathbb{R}^+$

$f'(x) = e^x > 0$

$f''(x) = e^x > 0$



$f(x) = \ln(x)$

$\mathbb{D} = x \in \mathbb{R}^+$

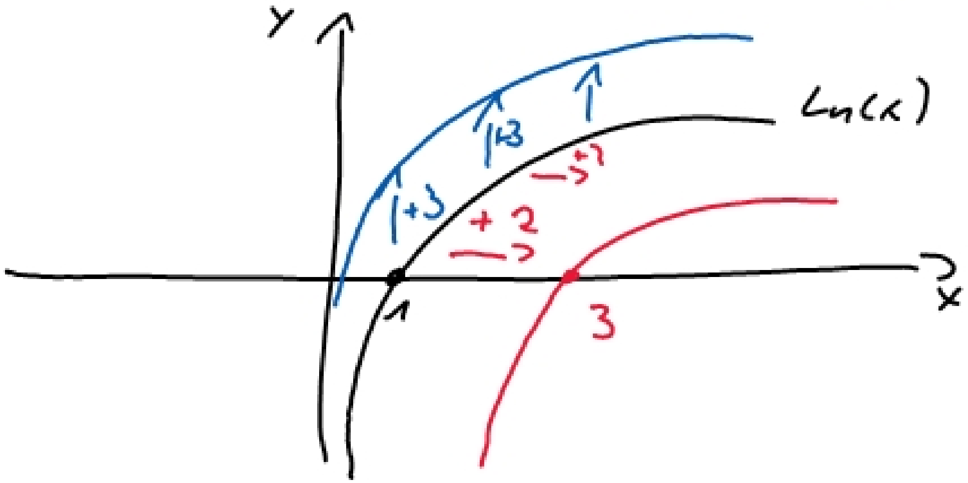
$\mathbb{W} = y \in \mathbb{R}$

$f'(x) = 1/x > 0$

$f''(x) = (x^{-1})' = -1 \cdot x^{-2} = -\frac{1}{x^2} < 0$

$\ln(0) = y$

$e^y = 0$ ↯



$f(x) = \ln(x) + 3$

$f(x) = \ln(x-2)$