

S 165

$$1) 6 \cdot \ln^3(e^2) - \frac{8}{e^{2\ln 2.5}} - \left(\frac{1}{2} e^{\ln 3^2} - \ln \sqrt[4]{e^2} \right) + \frac{8}{\ln e^2} + e^{2\ln 3}$$

$$\ln(e^{2.5})^6 - 8 e^{\ln(1/2)^{-2}} - \left(\frac{1}{2} \cdot 3^2 - \ln e^{-1/2} \right) + \frac{8}{2} + e^{\ln 3^2}$$

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

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

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

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

$$3) \frac{1}{16} \cdot \ln 2^3 + 3 \cdot e^{2\ln 0,5} - \log \sqrt{10} + 4 \cdot \left(2^{4 \ln 1/2} - 8 \cdot \ln \sqrt[4]{e^2} \right) - 4 \cdot 10^{\frac{1}{4} \log 256}$$

$$\frac{1}{16} \cdot 3 + 3 \cdot e^{\ln(1/2)^2} - \log 10^{1/2} + 4 \cdot \left(2^{\ln(1/2)^4} - 8 \cdot \ln e^{-1/2} \right) - 4 \cdot 10^{\log(256)^{1/4}}$$

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

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

$$4) 2/3 \cdot (\log 1000 - 1/2) - \frac{2}{e^{\ln 0.5}} + 2^{3 + \ln 3} - (10^3)^{\log 3} + \ln \left(\frac{1}{3}e\right)^2 - 4 \ln \sqrt{2}$$

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

$$2 - 1/3 - 4 + 8 \cdot 3 - 9 - 2/3 - 2 = 10$$

S. 169

$$I.1) 3 \cdot \log x - 4 \cdot \log^2 x - 1/3 \cdot \log (2x)^6 = 2/3 \log 27 + 1/2 \log x^4 - 2 \log 6$$

$$\log x^3 - \log (2x)^4 - \log (x^6)^{1/3} = \log 27^{2/3} + \log (x^4)^{1/2} - \log 6^2$$

$$\log \frac{x^3}{2^4 \cancel{x^4} \cdot \cancel{x^4}} = \log \frac{3^2 x^2}{6^2} \quad | \cdot 10^x$$

$$\frac{1}{16} x^3 = \frac{1 \cdot 9}{36} x^2 \quad | : x^2 \cdot 16$$

$$x = 4$$

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

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

S 169

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

$$\ln 4^3 - \ln (\sqrt[16]{x^4})^{1/2} + \ln 8^2 = \ln (x^4)^{3/2} - \ln (x^{-1/4})^8 - \ln (x^{1/16})^2$$

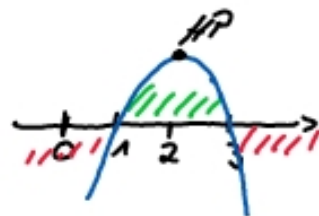
$$\ln \frac{4^3 \cdot 8^2}{4^{1/2}} = \ln \frac{x^6}{x^{-2} \sqrt[16]{x}} \quad | \uparrow e^x$$

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

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

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

$$II. 3) f(x) = 2,5 \cdot \ln(4x - 3 - x^2) = 2,5 \cdot \ln(-(x^2 - 4x + 3)) \\ = 2,5 \cdot \ln(-(x-3)(x-1))$$



$$\lim_{x \rightarrow 1^+} f(x) = [2,5 \cdot \ln(0^+)] = -\infty$$

$$f(2) = 2,5 \cdot \ln(1) = 0$$

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

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

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

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

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

ABLeitungen

$$G(x) = x^2 - 3x - 10 \\ (x-5)(x+2) = 0 \\ \Rightarrow L = \{5\}$$

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

$$f(x) = 3 \cdot x^4 \rightarrow f'(x) = 3 \cdot 4 \cdot x^{4-1} = 12 \cdot x^3$$

$$f(x) = 12 \cdot \sqrt[3]{x^2} \\ = 12 \cdot x^{2/3} \rightarrow f'(x) = 12 \cdot \frac{2}{3} \cdot x^{2/3-1} \\ = 8 \cdot x^{-1/3} = 8 \cdot \frac{1}{\sqrt[3]{x}}$$

Kettenregel

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

$$f(x) = (2-4x)^5 \rightarrow f'(x) = 5 \cdot (2-4x)^{5-1} \cdot (2-4x)' \\ = -20 \cdot (2-4x)^4$$

$$f(x) = 3 \cdot x^4 \rightarrow 3 \cdot 4 \cdot x^{4-1} \cdot (x)' \\ = 12x^3$$

Exponential

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

$$f(x) = e^{5-2x^2} \rightarrow f'(x) = e^{5-2x^2} \cdot (-4x)$$

Trigonometrie

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

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

$$f(x) = \sin(\sqrt{x}) \rightarrow f'(x) = \cos(\sqrt{x}) \cdot (\sqrt{x})'$$

$$(\sqrt{x})' = (x^{1/2})' = \frac{1}{2} \cdot x^{-1/2} = \frac{1}{2\sqrt{x}}$$

Logarithmus

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

$$f(x) = \ln(4+x^2) \rightarrow f'(x) = \frac{1}{4+x^2} \cdot 2x$$

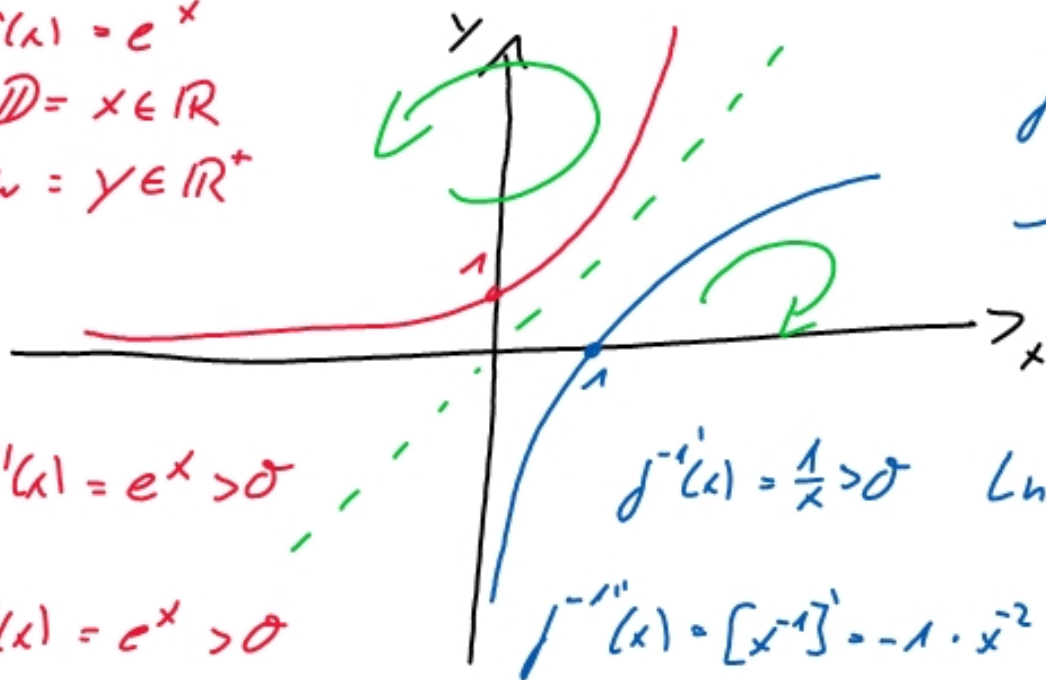
$$f(x) = e^x$$

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

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

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

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



$$f^{-1}(x) = \ln(x)$$

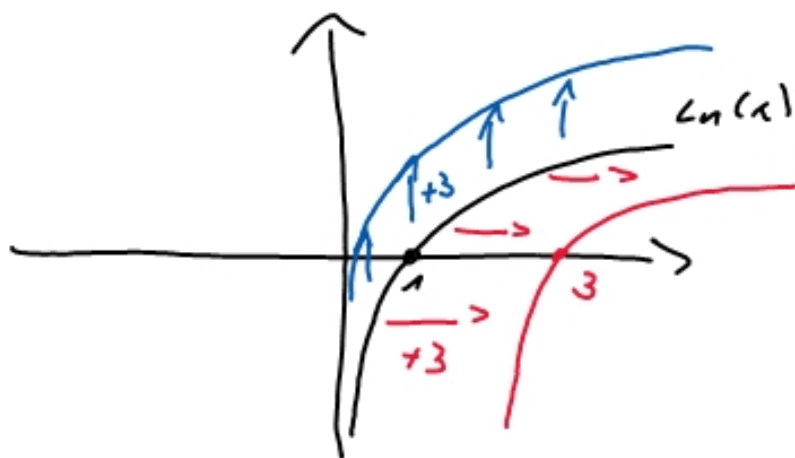
$$D = x \in \mathbb{R}^+$$

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

$$f^{-1}(x) = \frac{1}{x} > 0 \quad \ln 0 = y$$

$$e^y = 0 \quad \downarrow$$

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



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

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