1) $2 + \frac{1}{x} - \frac{2}{3} - \frac{1}{4x} - \left(\frac{7}{12} + \frac{4}{3}\right) = \frac{24x + 12 - 8x - 3 - 7x - 16x}{12 \cdot x} = \frac{9}{12x} - \frac{7x}{12x}$

$= \frac{3}{4x} - \frac{7}{12}$

2) $\dfrac{\frac{3a}{b} - 2 + \frac{b}{3a}}{\frac{18a}{b} - \frac{2b}{a}}$

3) $(0,5 - 2i)^4 \; ; \; i^2 = -1$

4) $\dfrac{2i - 3}{i + 2}$

$$\frac{\frac{(3a)^2 - 6ab + b^2}{3ab}}{\frac{18a^2 - 2b^2}{ab}} = \frac{(3a-b)^2}{3ab} \cdot \frac{ab}{2 \cdot \underbrace{(9a^2 - b^2)}_{(3a-b)(3a+b)}}$$

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

3)

$$1\left(\tfrac{1}{2}\right)^4 + 4\left(\tfrac{1}{2}\right)^3(-2i)^1 + 6\left(\tfrac{1}{2}\right)^2(-2i)^2 + 4\left(\tfrac{1}{2}\right)^1(-2i)^3 + 1(-2i)^4$$

$$\frac{1}{16} \quad - i \quad + 6i^2 \quad - 16i^3 \quad + 16i^4$$

$$\frac{1}{16} - 6 + 16 \qquad - i + 16i \qquad = 10\tfrac{1}{16} + 15i$$

$$\frac{4i-2}{3-i}\cdot\frac{3+i}{3+i}=\frac{12i+4i^2-6-2i}{9-i^2}\ ;\quad i=\sqrt{-1}$$

$$(a-b)\cdot(a+b)=(a^2-b^2)$$

$$\frac{12i+4\cdot(-1)-6-2i}{9-(-1)}=\frac{10i-10}{10}=\frac{10i}{10}-\frac{10}{10}=i-1$$

4) $$\frac{2i-3}{i+2}\cdot\frac{i-2}{i-2}=\frac{2i^2-4i-3i+6}{i^2-4}=\frac{4-7i}{-5}=-0{,}8+1{,}4i$$

$$\Rightarrow\ (0{,}25)^{-2}=\left(1/4\right)^{-2}=1^{-2}/4^{-2}=\frac{1}{4^{-2}}=4^2=16$$

$$\left(\frac{2x^2y^{-3}z^{-1}}{0{,}5\cdot x^{-3}\cdot y^2\cdot z^{-4}}\right)^{-3}=\frac{2^{-3}x^{-6}y^9z^3}{2^3x^9y^{-6}z^{12}}=\frac{y^9z^3y^6}{2^3x^6\,2^3x^9\,z^{12}}$$

$$0{,}5=1/2=2^{-1}$$

$$=\frac{y^{15}}{2^6z^9x^{15}}$$

S 47 Nr. 1: $\sqrt[3]{x^7}$; Nr. 2 $\frac{v^4 w^{10} s^{12}}{u}$; Nr. 3 $\sqrt[k]{a^8}$

1) $$\sqrt{x^3 \cdot \sqrt[4]{x^6 \sqrt[3]{x^2}}} = \left(x^3\left(x^6\left(x^2\right)^{1/3}\right)^{1/4}\right)^{1/2} = x^{3/2} \cdot x^{6/8} \cdot x^{2/24}$$

$$= x^{3/2} \cdot x^{3/4} \cdot x^{1/12} = x^{\frac{18+9+1}{12}} = x^{28/12} = x^{7/3}$$

2) $$\frac{(2^3 u^2 v^{-2} w)^4}{(3^4 r^{-3} s^{-2} t^3)^2} \cdot \frac{(3^4 \cdot r^{-3} s^4 t^3)^2}{(2^4 u^3 v^{-4} w^{-2})^3}$$

$$\left(\frac{2^{12} u^8 v^{-8} w^4}{3^8 r^{-6} s^{-4} t^6}\right) \cdot \left(\frac{3^8 r^{-6} s^8 t^6}{2^{12} u^9 v^{-12} w^{-6}}\right) = \frac{u^8 w^4 s^8 t^6 r^6 s^4 v^{12} w^6}{v^8 r^6 t^6 u^9}$$

$$= \frac{w^{10} s^{12} v^4}{u}$$

3) $$\frac{\sqrt[k]{a^{2-k}}}{\left(\sqrt[k]{a}\right)^{3k+4}} \cdot \left(\frac{\sqrt[k]{a}}{\left(\sqrt[k]{a}\right)^{k+3}}\right)^{-2} = \frac{a^{\frac{2-k}{k}} \cdot a^{-2/k}}{a^{\frac{3k+4}{k}} \cdot a^{\frac{-4k-12}{k}}} = a^{\frac{(2-k)+(-2)-(3k+4)-(-4k-12)}{k}}$$

$$a^{\frac{8}{k}} = \sqrt[k]{a^8}$$

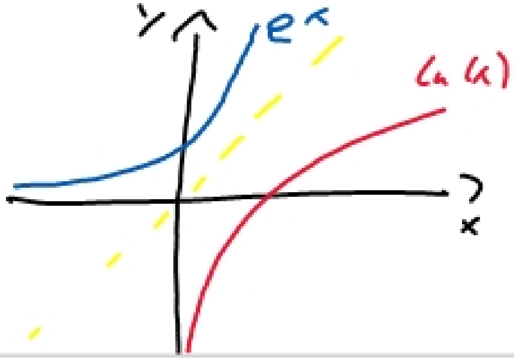
$$a^x = b \quad | \log$$
$$\lg(a^x) = \log(b)$$
$$x \cdot \log(a) = \log(b)$$
$$x = \log(b) / \log(a) = \log_a b$$

$$K(x) = K(0) \cdot 1{,}05^{-x}$$
$$2 \cdot K(0) = K(0) \cdot 1{,}05^{x} \quad | :K(0)$$
$$2 = 1{,}05^{-x}$$
$$x = \log_{1{,}05} 2$$

$\mathbb{D}$: Definitionsbereich

$$x = \log_a b \quad \Rightarrow \quad \log_a(<0) = x \Leftrightarrow a^x < 0 \quad ↯$$
$$\Rightarrow \quad \log_a(0) = x \Leftrightarrow a^x = 0 \quad ↯$$

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



S. 58 Nr. 3 $\quad 5\cdot \lg(2x) + 4\cdot \lg\sqrt{0{,}5x} - 0{,}5\cdot \lg(16x^4) - 2\cdot \lg(0{,}25)$

$$\lg(2x)^5 + \lg\left(\sqrt{\tfrac{1}{2}x}\right)^4 - \lg(16x^4)^{1/2} - \lg\left(\tfrac{1}{4}\right)^2$$

$$\lg \frac{(2x)^5 \cdot \left(\sqrt{\tfrac{1}{2}x}\right)^4}{(16x^4)^{1/2}\cdot\left(\tfrac{1}{4}\right)^2} = \lg \frac{2^5 x^5 \frac{1}{2^2} x^2}{4x^2 \cdot \frac{1}{4^2}}$$

$$\lg \frac{x^5\, 2^3}{1/4} = \lg x^5 \cdot 2^5 = \lg(2x)^5 = 5\cdot \lg(2x)$$

$\left(\sqrt{\tfrac{1}{2}x}\right)^4$

$\left(\left(\tfrac{1}{2}x\right)^{1/2}\right)^4$

$\left(\tfrac{1}{2}x\right)^{4/2}$

4) $\quad 2\cdot \ln(3a^2) - 6\cdot \ln\sqrt[3]{2a^4} + \tfrac{1}{3}\cdot \ln(27(a^2)^6) - 4\cdot \ln\left(\tfrac{2}{a}\right)$

$$\ln(3a^2)^2 - \ln\left[(2a^4)^{1/3}\right]^6 + \ln(27a^{12})^{1/3} - \ln\left(\tfrac{2}{a}\right)^4$$

$$\ln \frac{(3a^2)^2\ (27a^{12})^{1/3}}{\left((2a^4)^{1/3}\right)^6\ \left(\tfrac{2}{a}\right)^4} = \ln \frac{3^2 a^4 \cdot 3\, a^4}{2^2 a^8 \cdot 2^4/a^4} = \ln \frac{3^3\, a^4}{2^6}$$

$$\ln\left[\left(\tfrac{3}{4}\right)^3 \cdot a^4\right]$$

$$0{,}1^{\log 0{,}25} = \left(1/10\right)^{\log 1/4} = \left(10^{-1}\right)^{\log 1/4} = 10^{(-1)\cdot \log 1/4}$$

$$10^{\lg (1/4)^{-1}} = \left(1/4\right)^{-1} = 4$$

$$\left(1/8\right)^{\mathrm{ld}\, 0{,}1} = \left(2^{-3}\right)^{\mathrm{ld}\, 1/10} = 2^{-3\cdot \mathrm{ld}\, 1/10} = 2^{\mathrm{ld}\, (1/10)^{-3}} = \left(1/10\right)^{-3} = 1.000$$

$$0{,}01^{\boxed{\log}\, 0{,}5} = \left(10^{-2}\right)^{\log 1/2} = 10^{-2\cdot \log 1/2} = 10^{\lg (1/2)^{-2}}$$

$$= \left(1/2\right)^{-2} = 4$$

S 60 1) $\frac{1}{6}\,\mathrm{ld}\,2^3 + 3\cdot e^{2\cdot\ln 1/2} - \lg\sqrt{10} + 4\cdot\left(2^{4\,\mathrm{ld}\,1/2} - 8\cdot\ln\frac{1}{\sqrt{e}}\right) - 4\cdot 10^{1/4\,\lg 256}$

$e^{\ln \heartsuit}$

$\lg 10^{\#}$

$2^{\mathrm{ld}\,?}$

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

$\frac{1}{2} + 3\cdot(1/2)^2 - 1/2 + 4\cdot\left((1/2)^4 - 8\cdot(-1/2)\right) - 4\cdot 256^{1/4}$ $\rightarrow (2^8)^{1/4}$

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

$\rightarrow \underline{\underline{1}}$

S. 62 2) $3\cdot\ln 4 - \frac{1}{2}\cdot\ln\frac{16}{x^4} + 2\cdot\ln 8 = \frac{3}{2}\cdot\ln x^4 \cdot 8\cdot\ln\sqrt[4]{1} - 2\cdot\ln\frac{1}{4}$

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

$\sqrt{\sin(x^2)}$

$\ln\frac{4^3\quad 8^2}{(16/x^4)^{1/2}} = \ln\frac{(x^4)^{3/2}}{\left(\sqrt[4]{\frac{1}{x}}\right)^8\ (1/4)^2} \quad |1^{e^x} \qquad x = \underline{\underline{2}}$

$\sqrt{\sin^2(x)}$

$\sin(x)$

$\frac{4^3\cdot 8^2}{4/x^2} = \frac{x^6}{1/x^2\cdot 1/4^2} \iff \underline{4^2}\cdot 8^2\cdot x^2 = \underline{4^2}\cdot x^8 \;\left|\cdot \frac{1}{x^2}\right.$

$8^2 = x^6 \iff (2^3)^2 = 2^6 = x^6$