S155

1) $5\cdot\log(2x) + 4\cdot\log\sqrt{0{,}5x} - 0{,}5\cdot\log(16x^4) - 2\cdot\log(0{,}25)$

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

$\log \dfrac{\overset{8}{\cancel{32}}x^5 \cdot \tfrac{1}{4}\cdot \cancel{x^2}}{\underset{1}{\cancel{4}}\cdot \cancel{x^2}\quad \tfrac{1}{16}} = \log \dfrac{8x^5\cdot 16}{4} = \log(2x)^5$

$= 5\cdot\log(2x)$

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

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

$\ln \dfrac{9a^4\cdot 3a^4}{4a^8\quad \tfrac{16}{a^4}} = \ln\left(\dfrac{27}{64}\cdot a^4\right) = \ln\left(\tfrac{3}{4}\right)^3\cdot a^4$

$= 3\cdot\ln\tfrac{3}{4} + 4\cdot\ln a$

3) $A(0) = 2.000,-$ $p = 2\% = 0{,}02$ $\Rightarrow$ $q = 1+0{,}02 = 1{,}02$

a) $x \mathrel{\hat{=}}$ Jahre: $A(x) = 2000 \cdot 1{,}02^{3x}$ → alle 4 Monate $\cdot$ 3 = 1 Jahr (wachstum)

$A(10) = 2.000 \cdot 1{,}02^{30} = 3.622{,}72$

$x \mathrel{\hat{=}}$ Monate $A(x) = 2.000,- \cdot 1{,}02^{1/4\,x}$ → Zinsen nach 4 Monaten

$A(120) = 2.000,- \cdot 1{,}02^{1/4 \cdot 120} = 3.622{,}72$

b) $q_{Jahr} = 1{,}02^3 = 1{,}0612$ $\Rightarrow$ $p = 0{,}0612 = 6{,}12\ \%$

c) $K(x) = 2.691{,}74 = 2000,- \cdot 1{,}02^{3x}$ $| \cdot 2.000$

$1{,}346 = 1{,}02^{3x}$ $|$ LOG

$\lg 1{,}346 = \lg 1{,}02^{3x} = 3x \cdot \lg 1{,}02$ $| : (3 \cdot \lg 1{,}02)$

$\frac{\lg 1{,}346}{3 \cdot \lg 1{,}02} = 5$ Jahre

4) $A(4) = 34.209,2625\ L$ $\quad p = 5\,\% = 0{,}05 \Rightarrow q = 1-0{,}05 = 0{,}95$

zerfällt

a) $A(4) = 34.209,2625 = A(0) \cdot 0{,}95^4 \quad | : 0{,}95^4$

$A(0) = 42.000\ L = 42\ m^3$ $\quad 1\,L = 1\,dm^3$

b) $x \mathrel{\hat=}$ Tage : $A(x) = 42.000 \cdot 0{,}95^{1/7 x}$ → nach 7 Tagen: $-5\,\%$

$A(365) = 42.000 \cdot 0{,}95^{365/7}$

$A(365) = 2895,31\ L = 2.895.310\ cm^3$

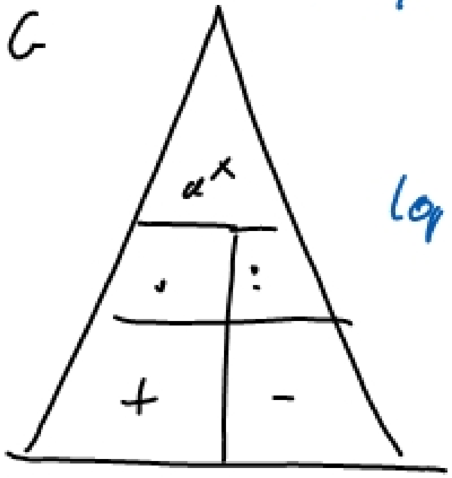
c) $A(x) < 21.000$

$A(x) = 21.000 = 42.000 \cdot 0{,}95^{1/7 x} \quad | : 42000$ $\quad x = 95$ Tage

$0{,}5 = 0{,}95^{1/7 x} \quad | \log$ $\quad \Uparrow$

$\log 0{,}5 = \log 0{,}95^{1/7 x} = 1/7\, x \cdot \log 0{,}95 \quad \ldots \Rightarrow x = 94{,}59$

LOG



$5 \cdot \log 2 = \log 2^5$

$= \log 32$

$\log 2 + \log 3$

$\log 2 \cdot 3$

$\log 6$

$a^x = 5 \quad | \log$

$\log a^x = \log 5$

$x \cdot \log a = \log 5 \quad | : \log a$

$x = \log 5 / \log a$

$x = \log_a 5$

$4 \cdot \log \sqrt{x^3} - 3 \cdot \log 2 = \frac{1}{3} \cdot \log x^6$

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

$\log x^6 - \log 8 = \log x^2$

$\log \frac{x^6}{8} = \log x^2 \quad | \uparrow 10^x$

$\frac{x^6}{8} = x^2 \quad | \cdot 8 \cdot \frac{1}{x^2}$

$x^4 = 8 \quad | \sqrt[4]{\ }$

$x = \sqrt[4]{8}$

exp. Wachstum | Zerfall

$q > 1$ | $|q| < 1$

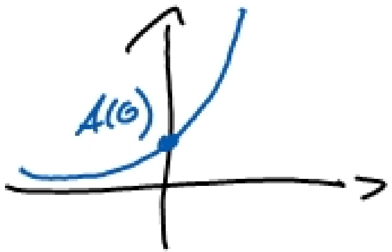
$$A(x) = A(0) \cdot q^x$$

$10\,m^2$ Algen, pro Monat $+3\%$

$$\left.\begin{aligned} A(0) &= 10\,m^2 \\ q &= 1 + 0{,}03 = 1{,}03 \\ x &\mathrel{\hat=} \text{Monat} \end{aligned}\right\} A(x) = 10 \cdot 1{,}03^x$$

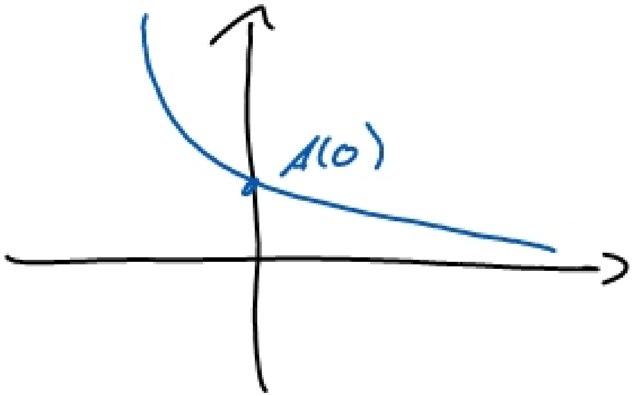
$x \mathrel{\hat=}$ Jahre: $1{,}03^{12}$

$$A(x) = 10 \cdot 1{,}03^{12 \cdot x}$$



1kg radioaktives Jod
Halbwertszeit von 500 Jahren

$$\left.\begin{aligned} A(0) &= 1\,kg \\ q &= 0{,}5 \\ x &\mathrel{\hat=} \text{Jahre} \end{aligned}\right\} A(x) = 1\,kg \cdot 0{,}5^{\frac{1}{500} x}$$



$$64^{2\,\mathrm{ld}\,0{,}1} = \left(2^6\right)^{\mathrm{ld}\,0{,}1^2} = 2^{6\cdot\mathrm{ld}\,0{,}1^2} = 2^{\mathrm{ld}(0{,}1)^6}$$

$2^?$

$$= 0{,}1^{12} = 10^{-12}$$

$$4\cdot\ln\frac{1}{\sqrt{e^3}} = 4\cdot\ln e^{-3/2} = 4\cdot\left(-3/2\right) = -6$$

4) $$\left(1/\sqrt{e}\right)^{\ln 1/9} + 100^{\lg 1/2^{-2}} - 16^{1/2\,\mathrm{ld}\,4} + 2\cdot\lg 0{,}001 - 3\ln 1/e^3 + 1/4\,\mathrm{ld}\,1/256$$

$$e^{-1/2\ln 1/9} + 10^{2\lg 4} - 2^{4\cdot 1/2\,\mathrm{ld}\,4} + 2\cdot\lg 10^{-3} - 3\ln e^{-3} + \mathrm{ld}\left(2^{-8}\right)^{1/4}$$

$$3 + 16 - 16 - 6 + 9 - 2$$

$$4$$

$$[e^{\heartsuit}]' \rightarrow e^{\heartsuit} \cdot \heartsuit' \qquad [e^x]' = e^x \cdot (x)' = e^x \cdot 1$$

$$(e^{2x^2-7}) \rightarrow e^{2x^2-7} \cdot (2x^2-7)' = e^{2x^2-7} \cdot (4x)$$

$$(2^x)' = [(e^{\ln 2})^x]' = (e^{\ln 2 \cdot x})'$$

$$\Rightarrow e^{\ln 2 \cdot x} \cdot (\ln 2 \cdot x)'$$

$$2^x \cdot \ln 2$$

$$(a^x)' = a^x \cdot \ln a$$