S155

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

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

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

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

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

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

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

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

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

wachstum

a) $x \,\hat{=}\,$ Jahre: $\quad A(x) = 2000 \cdot 1{,}02^{3x}$ -> alle 4 Monate · 3 = 1 Jahr

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

$x \,\hat{=}\,$ Monate $\quad A(x) = 2.000,- \cdot 1{,}02^{\frac{1}{4}x}$ -> Zinsen nach 4 Monaten

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

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

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

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

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

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

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

Zerfall

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

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

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

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

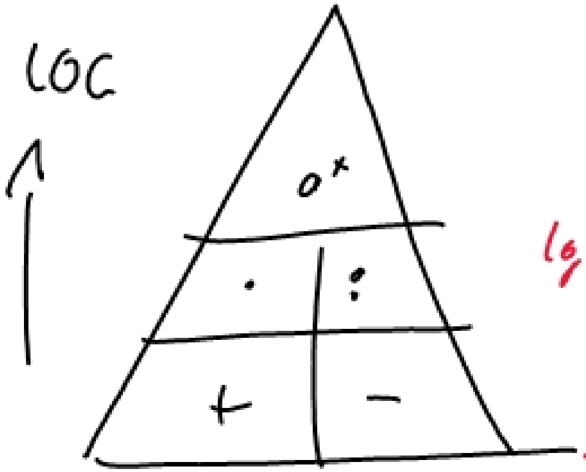
$A(365) = 2895{,}31\ L = 2.895.310\ cm^3$

c) $A(x) < 21.000$

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

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

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



$$x = \log_a b \longleftarrow a^x = b \quad | \log$$

$$\log a^x = \log b$$

$$x \cdot \log a = \log b$$

$$x = \log b / \log a$$

$$\log 2 + \log 5 = \log 2 \cdot 5$$
$$= \log 10$$

$$3 \cdot \log 2 = \log 2^3$$
$$= \log 8$$

$$2 \cdot \log 4 - 3 \cdot \log x^2 + \tfrac{1}{2} \cdot \log x^4 = \tfrac{1}{3} \cdot \log x^6$$

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

$$\log \frac{16 \; x^2}{x^6} = \log x^2 \quad | \uparrow 10^x$$

$$\frac{16}{x^4} = x^2 \quad | \cdot x^4 \qquad x^6 = 16 \quad | \sqrt[6]{\;}$$

$$x = \sqrt[6]{16}$$

$$64^{2\,\mathrm{ld}\,3} = (2^6)^{\mathrm{ld}\,3^2} = 2^{6\cdot \mathrm{ld}\,3^2} = 2^{\mathrm{ld}\,(3^2)^6} = 3^{12}$$

2?

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

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

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

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

$$4$$

exp. Wachstum / Zerfall $\quad A(x) = A(0) \cdot q^x$

$q > 1$ wachsen $\quad |q| < 1$ Zerfall

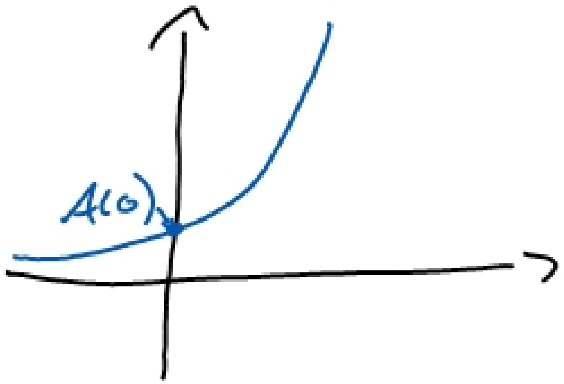
10 m² Algen
pro Monat + 3%

$$A(x) = 10\,m^2 \cdot 1{,}03^x$$

$x \hat{=}$ Monat

$x \hat{=}$ Jahre

$$A(x) = 10\,m^2 \cdot 1{,}03^{12 \cdot x}$$



Halbwertszeit
↳ $q = 0{,}5$

500 g radioaktives Jod
mit 1000 Jahre (HWZ)

$$A(x) = 500\,g \cdot 0{,}5^{1/1000 \cdot x}$$

$x \hat{=}$ Jahre