S155

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

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

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

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

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

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

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

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

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

wachstum

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

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

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

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

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

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

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

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

$\frac{1}{3} \cdot \log_{1{,}02} 1{,}346$

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

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

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

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

c) $A(x) < 21.000$

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

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

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

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

$2^?$

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

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

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

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

4) $(a^x)'$

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

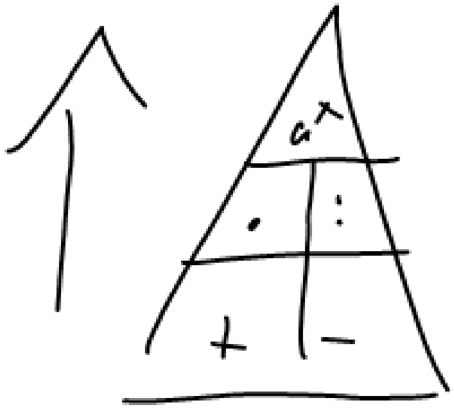
$(e^x)' = e^x\cdot(x)'$

$$x = \log_a b \longleftrightarrow a^x = b \qquad | \log$$

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

$$x \cdot \log a = \log b \qquad | : \log a$$

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



$$\log a + \log b = \log a \cdot b$$

$$2 \cdot \log x - 3 \cdot \log \sqrt[6]{x} = 3 \cdot \log 2 + \frac{1}{2} \log x^8$$

$$\log x^2 - \log (x^{1/6})^3 = \log 2^3 + \log (x^8)^{1/2}$$

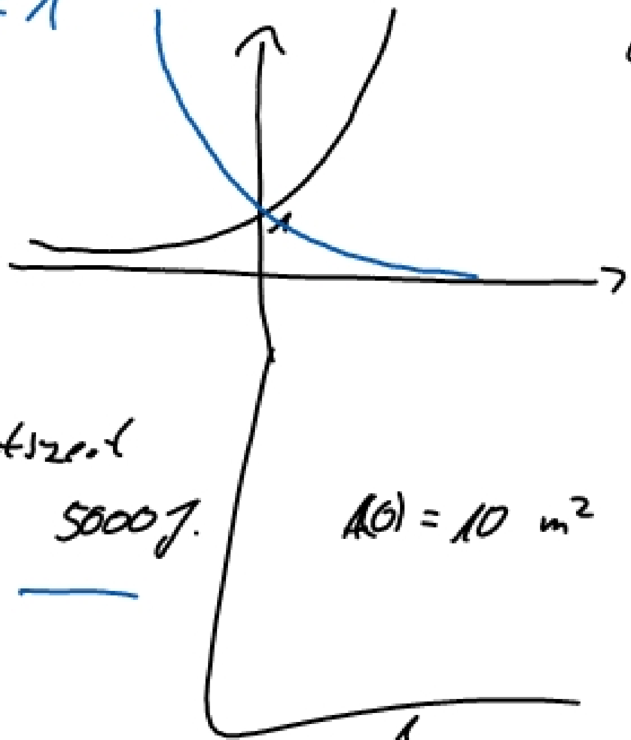
$$\log \frac{x^2}{x^{1/2}} = \log 8 \cdot x^4 \qquad | 10^x$$

$$x^{3/2} = 8 \cdot x^4 \qquad | : x^4 \qquad x = 8^{-2/5}$$

$$x^{-5/2} = 8 \qquad | \uparrow^{-2/5} \qquad = \frac{1}{\sqrt[5]{8^2}}$$

exp. Wachstum / Zerfall

$|q| < 1$



$q^x \Rightarrow q > 1$

$$\boxed{A(x) = A(0) \cdot q^x}$$

$x \mathrel{\hat{=}}$ Monat

$p = 3\% = 0{,}03$

$q = 1 + 0{,}03 = 1{,}03$

Halbwertszeit von <u>5000 J.</u>

$A(0) = 10\ m^2$

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

$x \mathrel{\hat{=}}$ Jahre

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

$$A(x) = 1\ kg \cdot 0{,}5^{\frac{1}{5000} x}$$

$\downarrow$

$x \mathrel{\hat{=}}$ Jahre