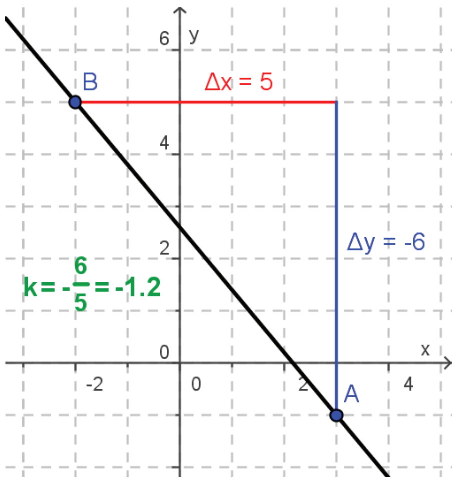
Logarithmische Skalen

Arbeitsblatt – Lösungen

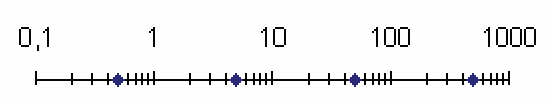
1 a) 1,13 b) 2,33 c) −0,77 d) 3,58

2 siehe Grafik rechts;
Steigung $k = -1{,}2$
$\Delta x = 5, \ \Delta y = -6$

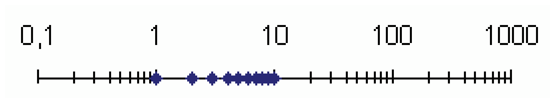


3 0,5; 5; 30; 200

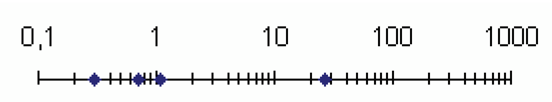
4 a)



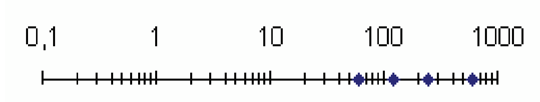
b)



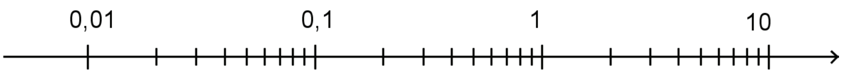
c)



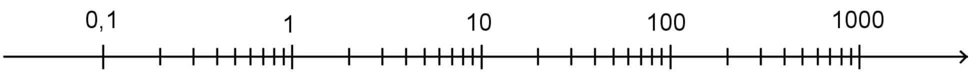
d)



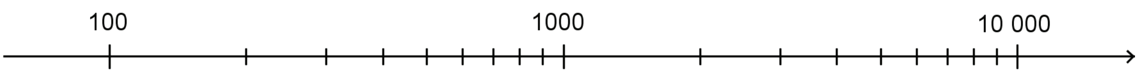
5 a)



b)

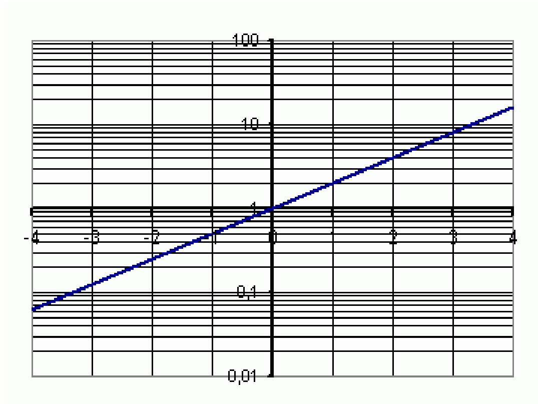


c)

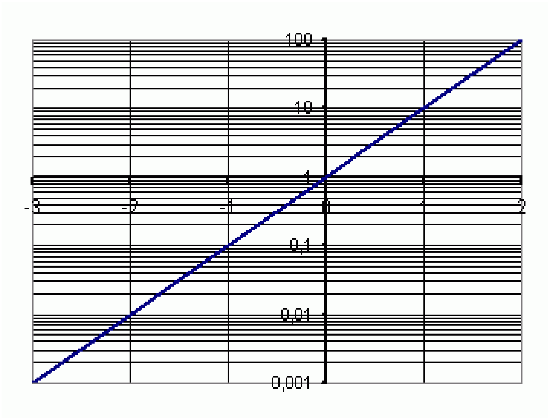


6

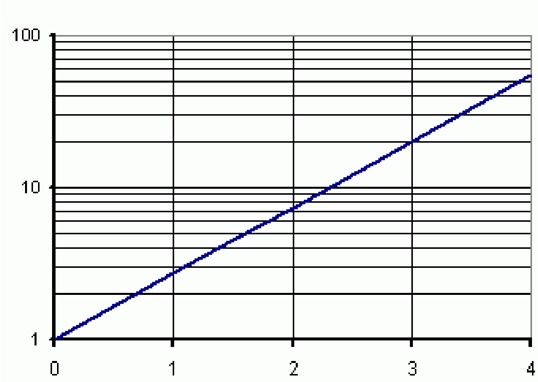
a)


100
10
1
0,1
0,01
-4 -3 -2 -1 0 1 2 3 4

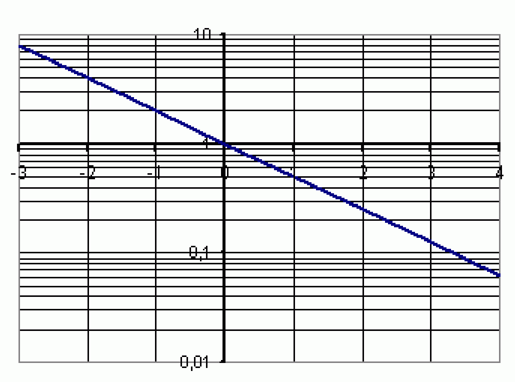
b)


100
10
1
0,1
0,01
0,001
-3 -2 -1 0 1 2

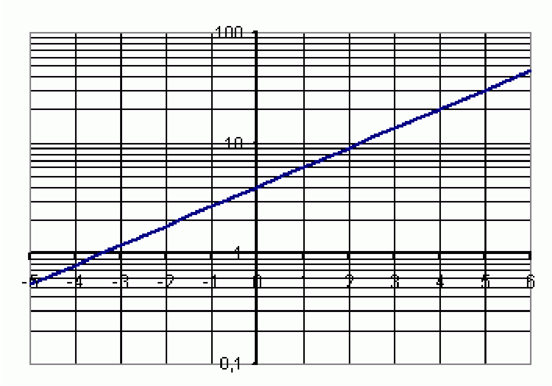
c)


100
10
1
0 1 2 3 4

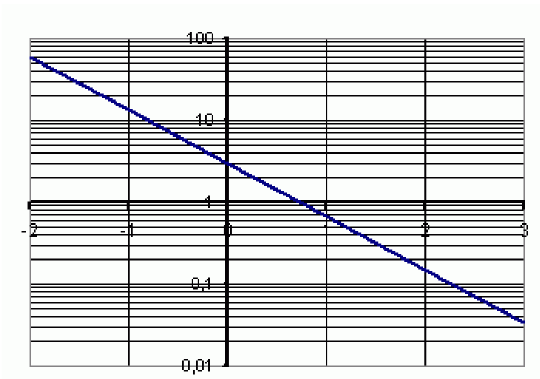
d)


10
1
0,1
0,01
-3 -2 -1 0 1 2 3 4

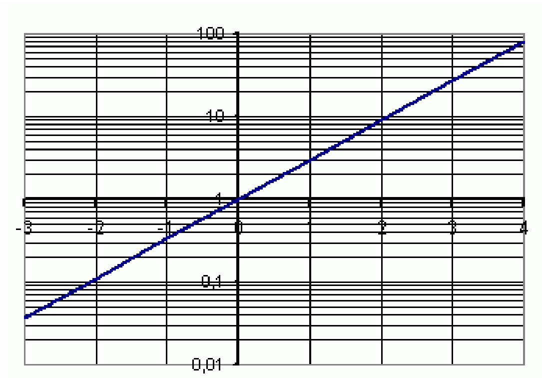
e)


100
10
1
0,1
-5 -4 -3 -2 -1 0 1 2 3 4 5 6

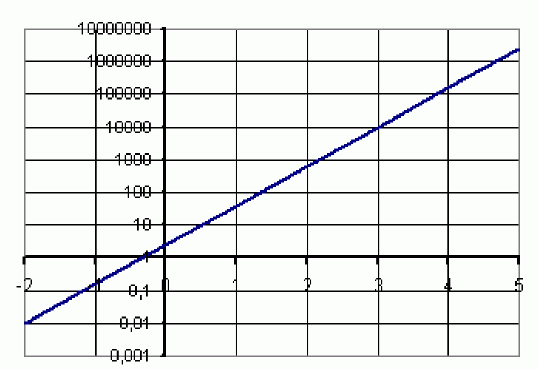
f)


100
10
1
0,1
0,01
-2 -1 0 1 2 3

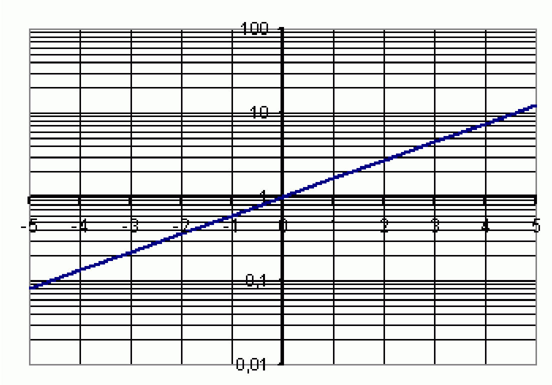
7 a)



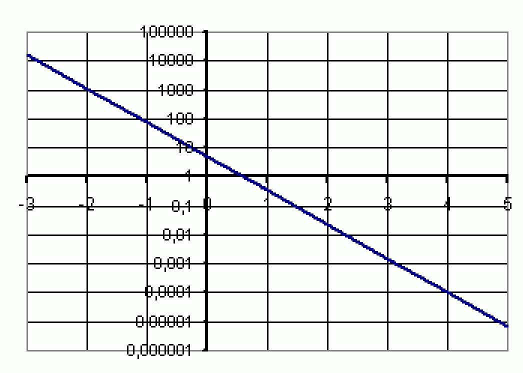
b)



c)



d)



8 a) Aus $y = a \cdot b^x$ folgt durch Logarithmieren und der Beachtung der Zeicheneinheit mit $Y = \ell \cdot \lg y$
$\lg y = \lg(c \cdot a^x) = \lg c + x \cdot \lg a \;\Rightarrow\; \ell \cdot \lg y = \lg c \cdot \ell + x \cdot \lg a \cdot \ell$
Setzt man nun für $\lg c \cdot \ell = d$ und für $\lg a \cdot \ell = k$, so erhält man die Geradengleichung $Y = k \cdot x + d$.

b) Aus $y = a \cdot b^x$ folgt durch Logarithmieren und der Beachtung der Zeicheneinheiten mit $Y = \ell_y \cdot \lg y$ und $X = \ell_x \cdot x$:
$\lg y = \lg(c \cdot a^x) = \lg c + x \cdot \lg a \;\Rightarrow\; \ell_y \cdot \lg y = \lg c \cdot \ell_y + x \cdot \frac{\ell_x}{\ell_x} \cdot \lg a \cdot \ell_y \;\Rightarrow\; Y = \lg c \cdot \ell_y + X \cdot \frac{\ell_y}{\ell_x} \cdot \lg a$
Setzt man nun für $\lg c \cdot \ell_y = d$ und für $\lg a \cdot \frac{\ell_y}{\ell_x} = k$, so erhält man die Geradengleichung $Y = k \cdot X + d$.

9 $y = a \cdot b^x \;\Rightarrow\; 1 = a \cdot b^0 \;\Rightarrow\; a = 1$
$10^6 = a \cdot b^{10} \;\Rightarrow\; b = \sqrt[10]{10^6} \approx 3{,}981 \;\Rightarrow\; y = 3{,}981^x$

10 Zeicheneinheiten $\ell_x = \ell_y = 1$;
$y = c \cdot e^{k \cdot x} \;\Rightarrow\; \ln y = \ln c + k \cdot x \cdot \ln e = \ln c + k \cdot x$
Mit $Y = \ln y$ und $\ln c = d$ folgt $Y = k \cdot x + d$.

11 a) $y = 3 \cdot 2^x$ b) $y = 2{,}5 \cdot 1{,}5^x$ c) $y = 5 \cdot 2^{-x} = 5 \cdot 0{,}5^x$ d) $y = 0{,}5 \cdot 0{,}8^x = 0{,}5 \cdot 1{,}25^{-x}$

12 Näherungsweises Ablesen von $(0|1 \cdot 10^6)$ und $(40|3 \cdot 10^4)$
$\Rightarrow$ Steigung $\lambda = \frac{\ln 10^6 - \ln 3 \cdot 10^4}{40} \approx 0{,}087664\,d^{-1} \;\Rightarrow\; \tau = \frac{\ln 2}{\lambda} \approx 7{,}9\,d$

13 a) $(0|1)$ und $(0{,}9|0{,}105) \;\Rightarrow\; I_0 = 1\,A$; Steigung $\frac{R}{L} = -\frac{\ln 1 - \ln 0{,}105}{0{,}9} \approx 2{,}5\,s^{-1}$
b) $L = \frac{R}{2{,}5} = 20\,H$