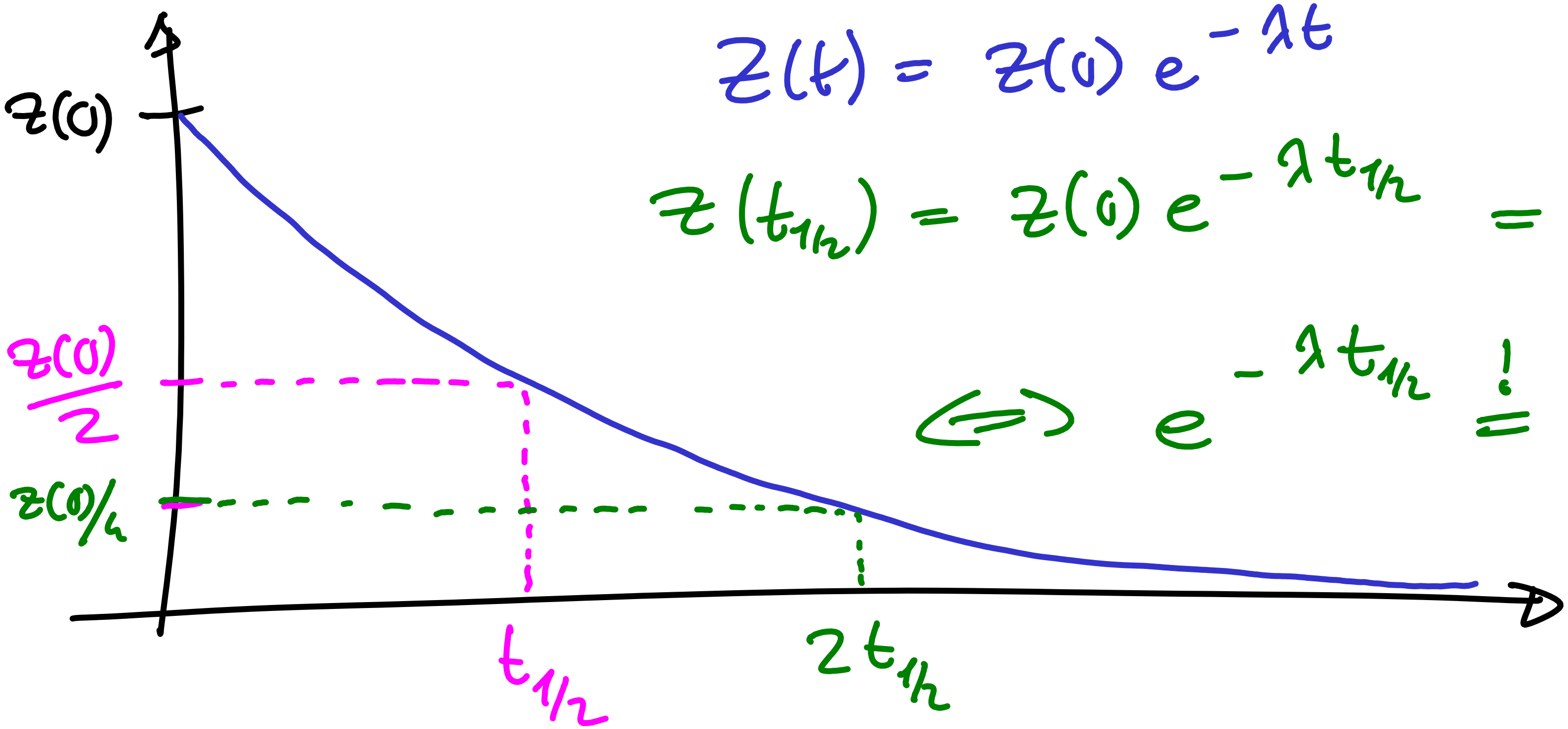


$$z(t) = z(0)\, e^{-\lambda t}$$

$$z(t_{1/2}) = z(0)\, e^{-\lambda t_{1/2}} = \frac{z(0)}{2}$$

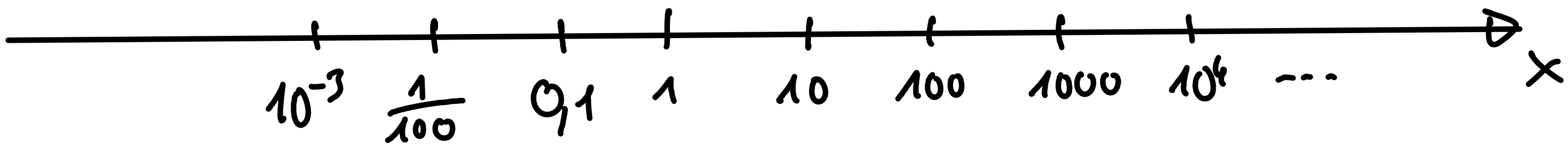
$$\Leftrightarrow \quad e^{-\lambda t_{1/2}} \overset{!}{=} \frac{1}{2}$$

logarithmieren

$$e^{-\lambda t_{1/2}} = \frac{1}{2} \quad \Leftrightarrow \quad -\lambda\, t_{1/2} = \log\left(\frac{1}{2}\right) = -\log(2)$$

$$\Leftrightarrow \quad t_{1/2} = \frac{\log 2}{\lambda} \quad \text{bzw.} \quad \lambda = \frac{\log 2}{t_{1/2}}$$

Achsenbeschriftung



$-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \qquad \log_{10} x$

$-3\log 10 \qquad 0 \qquad 2\log 10 \qquad \log x$

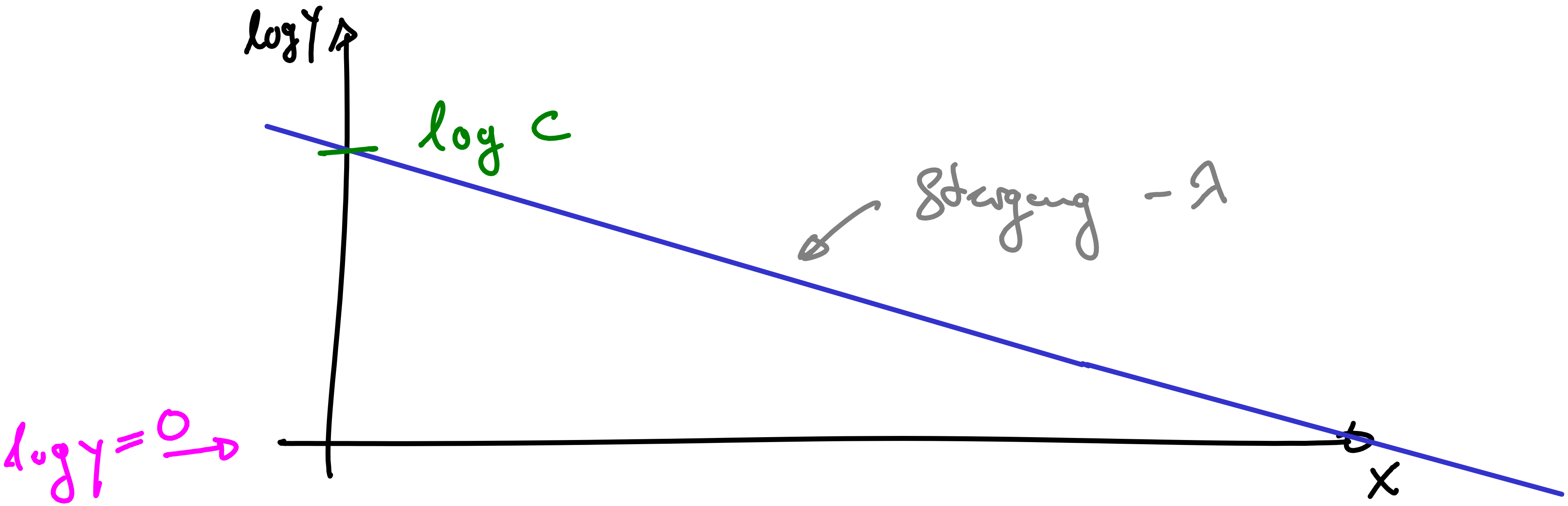
$$\log(10^n) = n \log 10$$

$$\log_{10}(10^n) = n$$

logarithmische Skaleneinteilung (y-Achse)

$$y = c\, e^{-\lambda x}$$

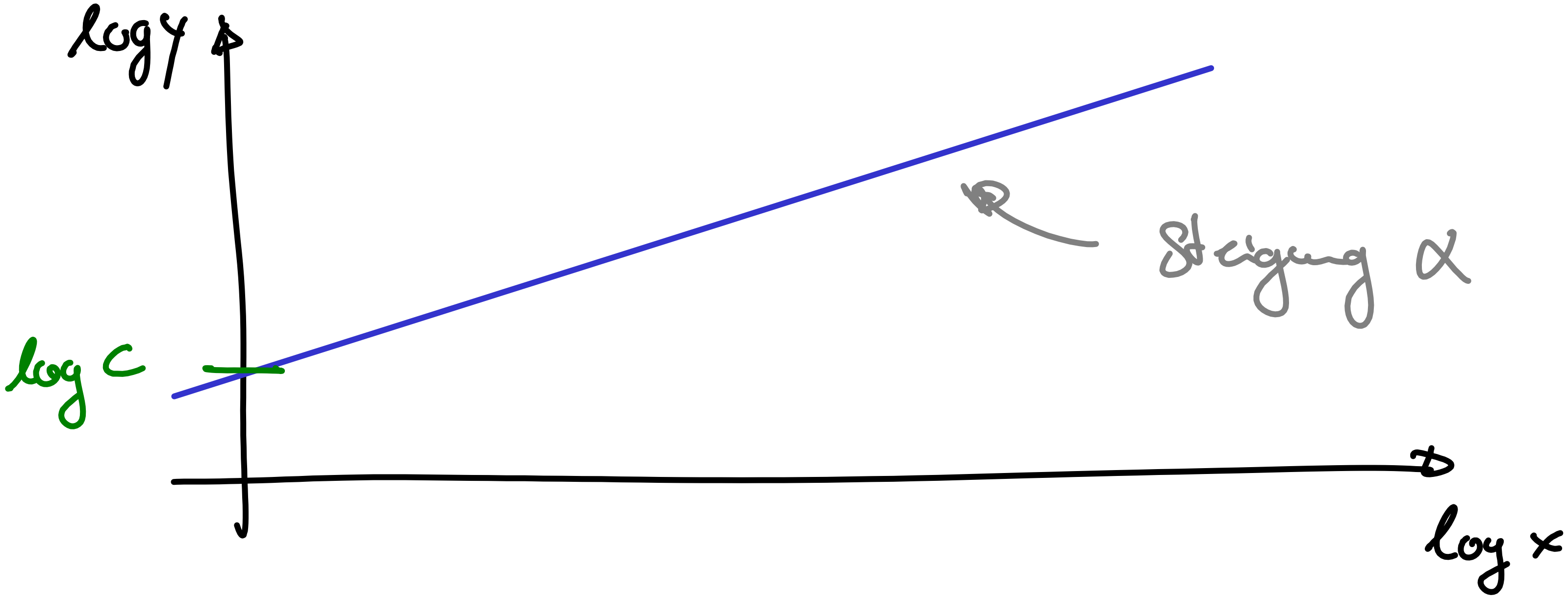
$$\log y = \log\left(c \cdot e^{-\lambda x}\right) = \log c - \lambda x$$



doppelt logarithmisches Diagramm

$$y = c\, x^{\alpha}$$

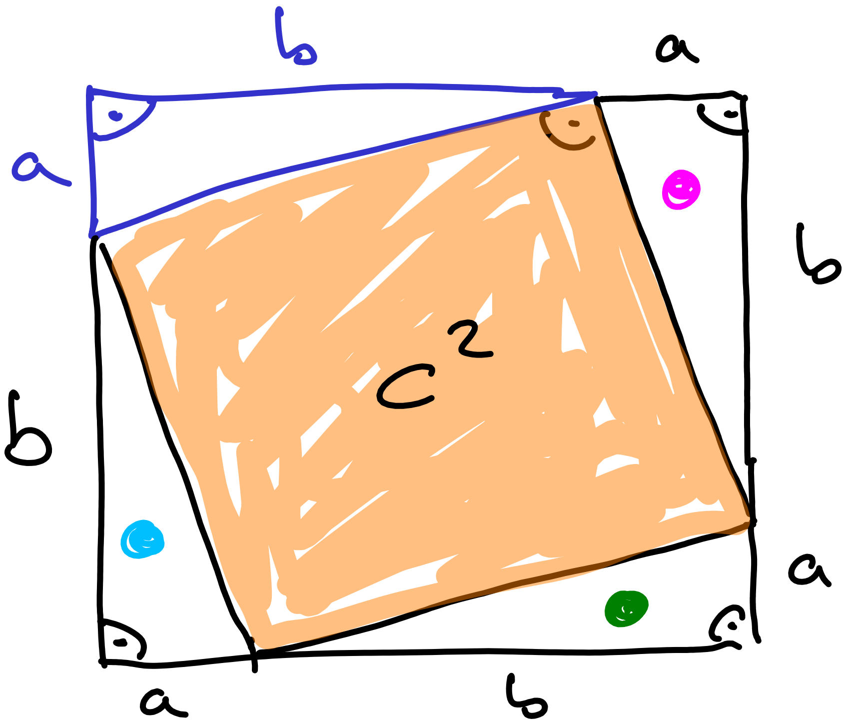
$$\log y = \log c + \log x^{\alpha} = \log c + \alpha \log x$$

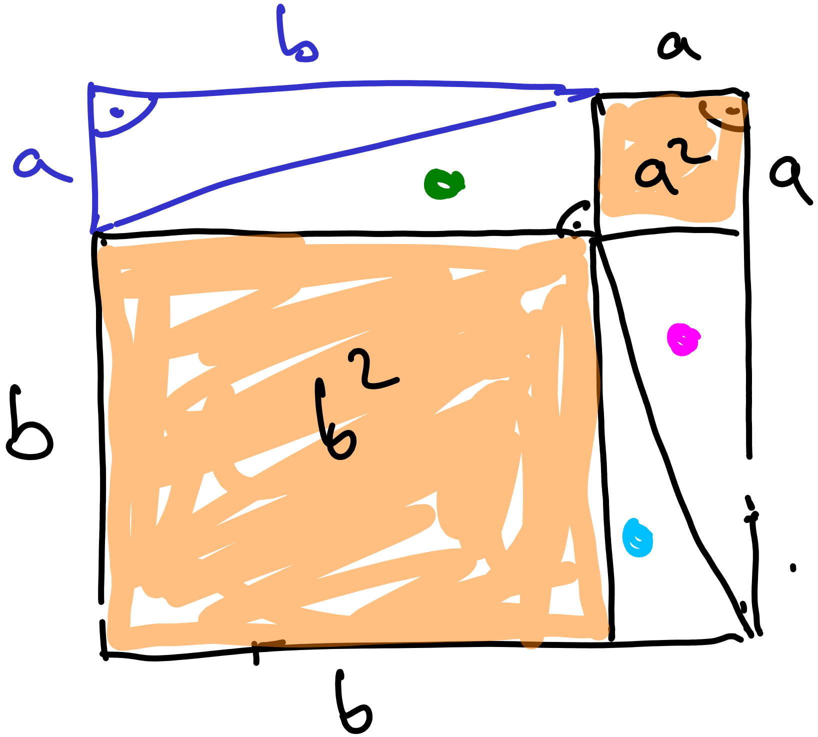


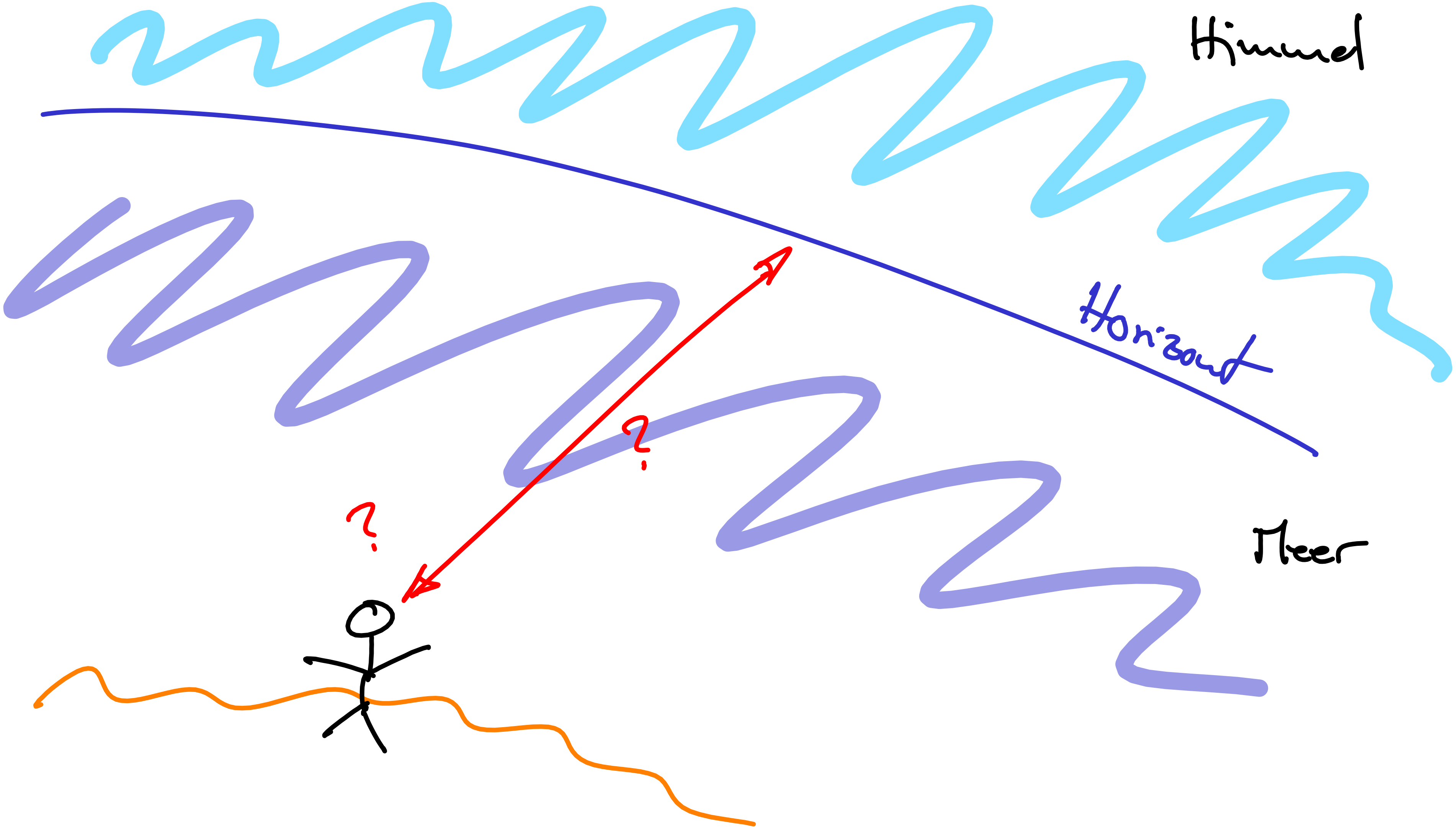
$$\alpha^x = e^{\log(\alpha^x)} = e^{x \cdot \log \alpha}$$

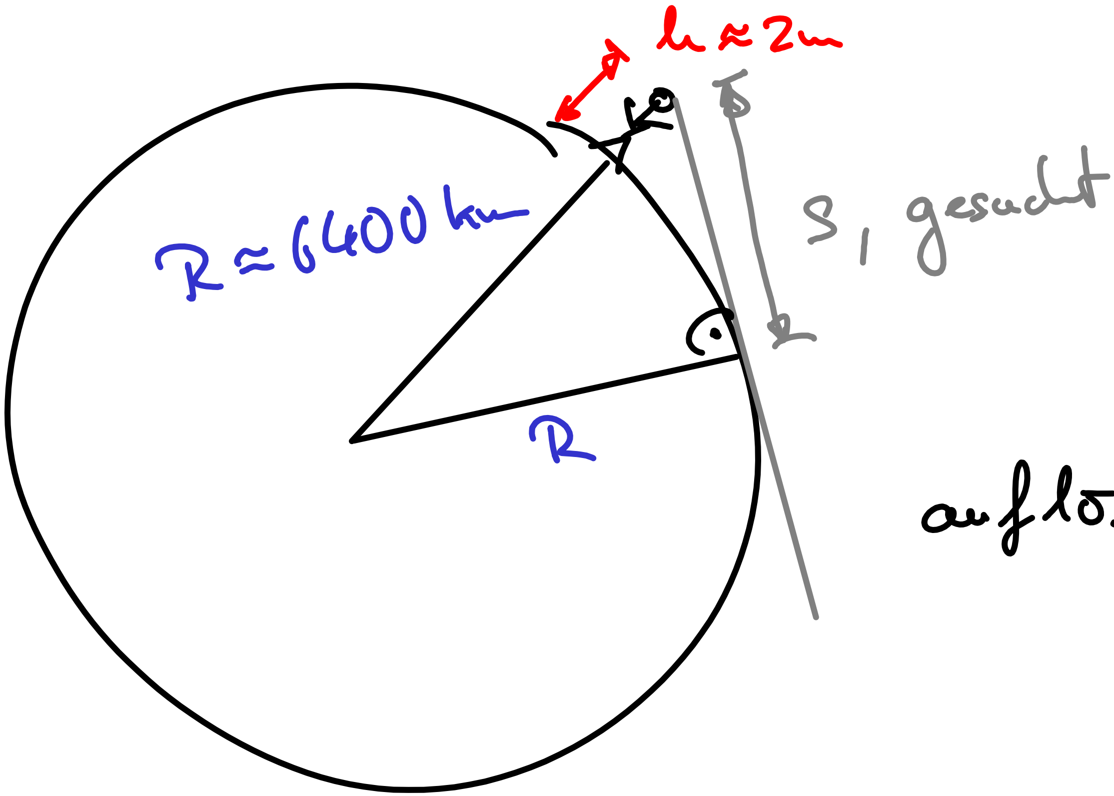
$$\log x = \log\left(\alpha^{\log_\alpha x}\right) = \log_\alpha x \cdot \log \alpha$$

$$\underset{\alpha \neq 1}{\Longleftrightarrow} \quad \log_\alpha x = \frac{\log x}{\log \alpha}$$


b
a
a
b
c²
b
a
a
b


b
a
a
a²
a
b
b²
b


Himmel
Horizont
?
?
Meer



$$(R+h)^2 = R^2 + s^2$$

auflösen nach s

$$\Leftrightarrow \quad \cancel{R^2} + 2Rh + h^2 = \cancel{R^2} + s^2$$

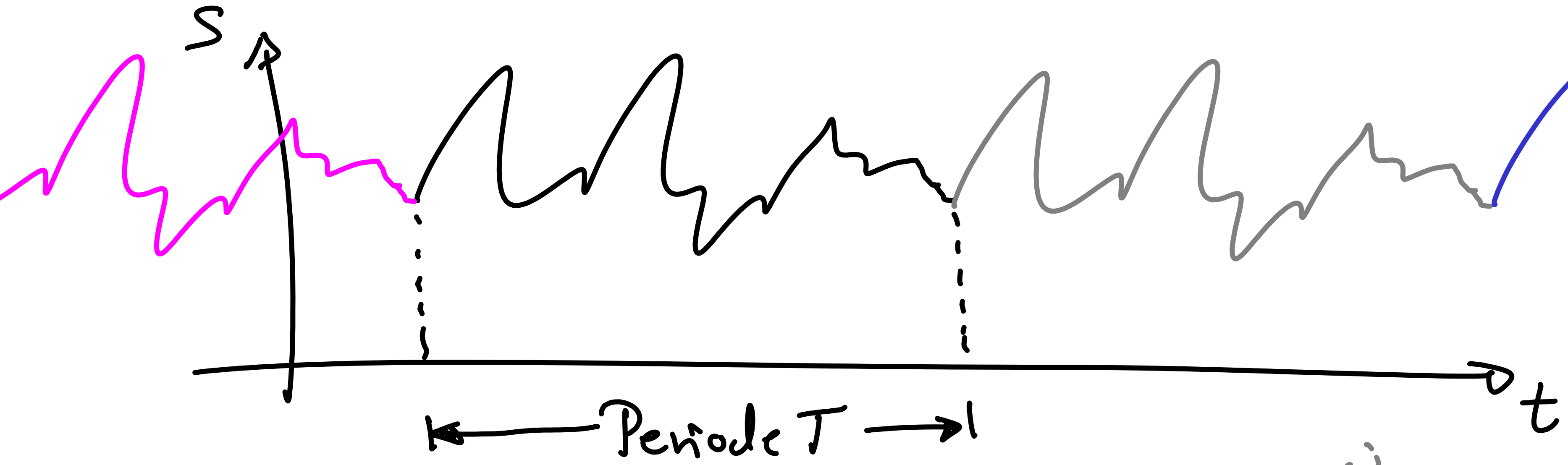
winzig gegenüber $2Rh$

$$\Rightarrow \quad s^2 \approx 2Rh \qquad (\text{da } h \ll R)$$

also $\quad s = \sqrt{2Rh} = \sqrt{2 \cdot 6400\,km \cdot 2m} \approx 5\,km$

$$\tan\alpha = \frac{14\,m}{100\,m} = 14\%$$

Schwingungsphänomene



$$s(t+T) = s(t)$$

Summe solcher Terme:

$\sin\left(\frac{2\pi}{T}t\right)$, $\cos\left(\frac{2\pi}{T}t\right)$,

$\sin\left(\frac{4\pi}{T}t\right)$, $\cos(\dots)$

$\sin\left(\frac{6\pi}{T}t\right)$, ...

(Fourierreihe)

$$S(t) = c \cdot \sin(\underline{\omega} t + \alpha)$$

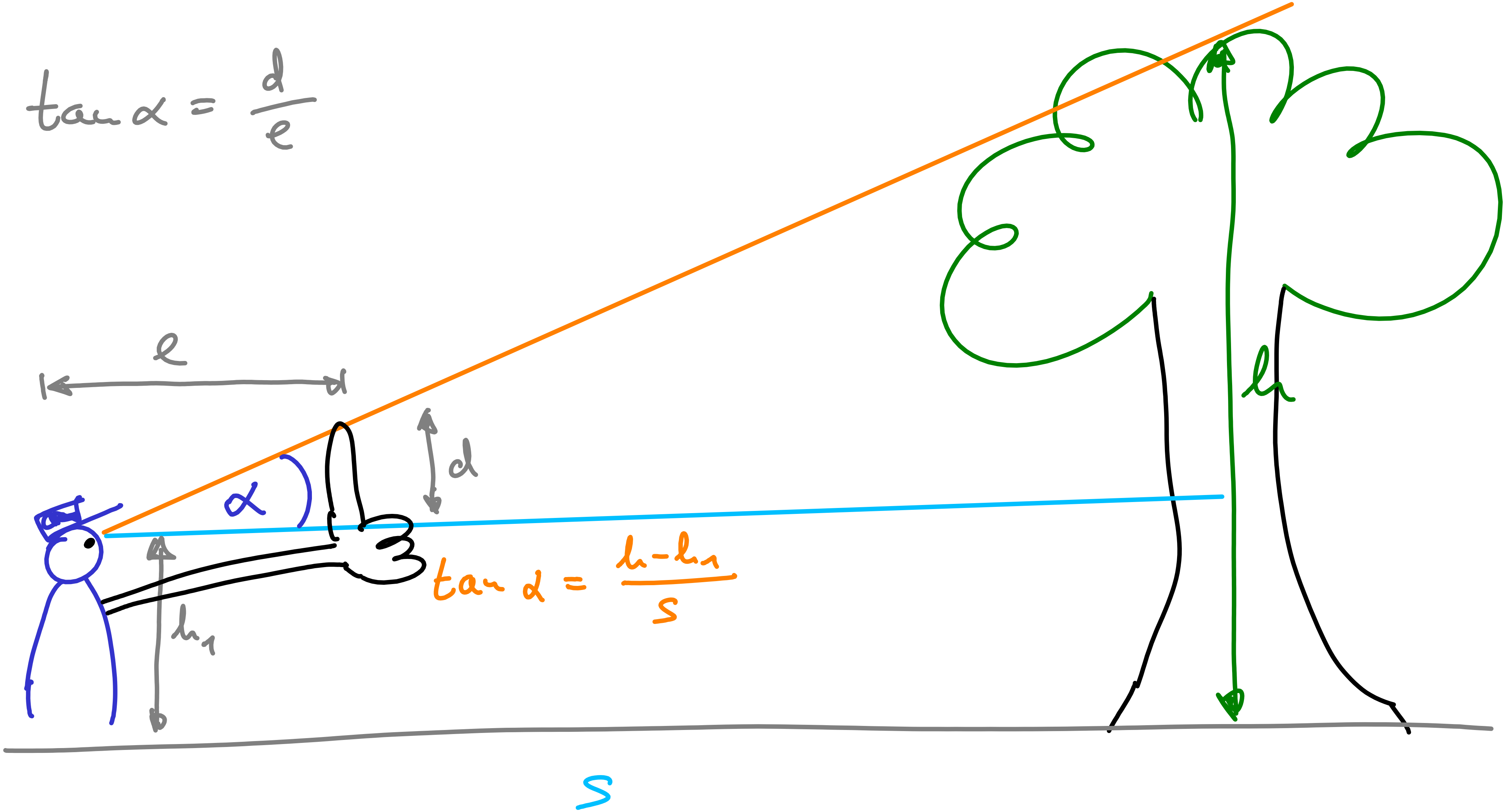
$$S\left(t + \frac{2\pi}{\omega}\right) = c \sin\left(\omega\left(t + \frac{2\pi}{\omega}\right) + \alpha\right)$$

$$= c \sin(\omega t + \underline{\underline{2\pi}} + \alpha)$$

$$= c \sin(\omega t + \alpha) = S(t)$$

also Periode $T = \frac{2\pi}{\omega}$

$$\tan\alpha = \frac{d}{e}$$



$$\Rightarrow h = h_1 + s\tan\alpha$$
$$= h_1 + s\,\frac{d}{e}$$

$$\tan \varphi = \frac{s}{b}$$

$$\Leftrightarrow \varphi = \arctan\left(\frac{s}{b}\right)$$