Blatt 5

ÜA 26:

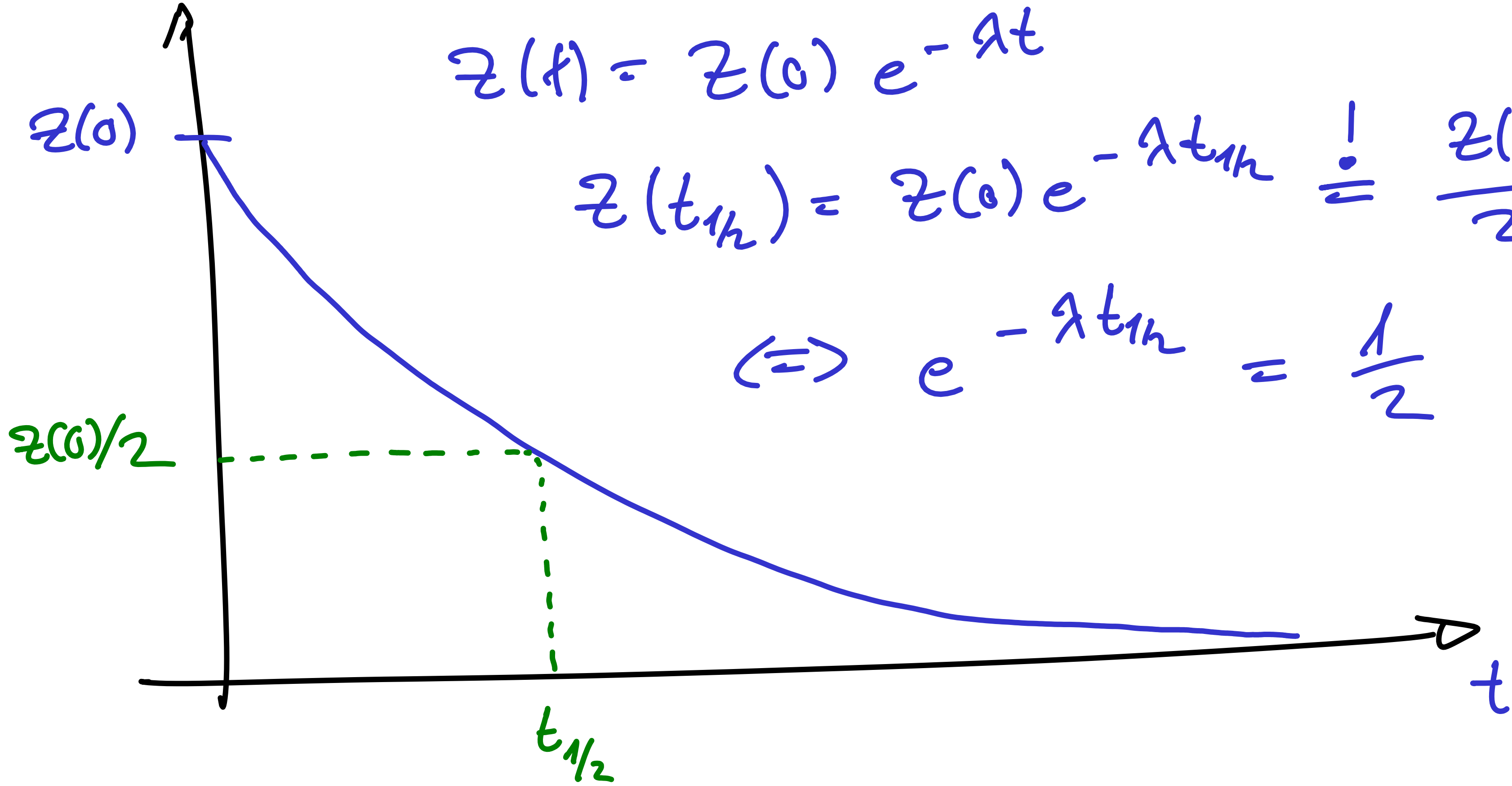
$\alpha < 1$ - - - - -

$\alpha > 1$ ———

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

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

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



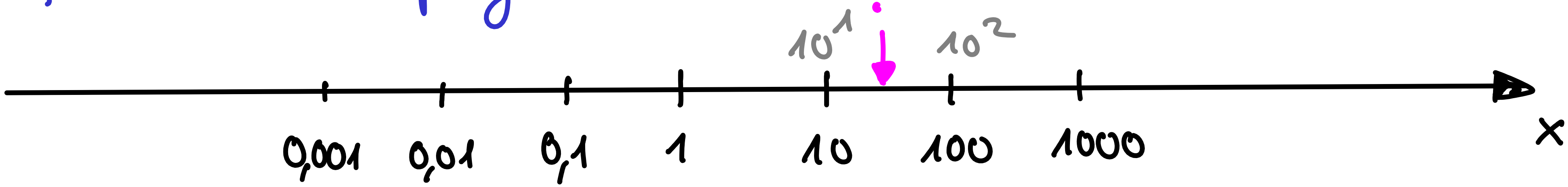
Logarithmieren von $e^{-\lambda t_{1/2}} = \frac{1}{2}$:

$$-\lambda t_{1/2} = \log\left(\tfrac{1}{2}\right) = -\log 2$$

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

Achsenbeschriftung

$10^{3/2} = \sqrt{1000}$



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

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

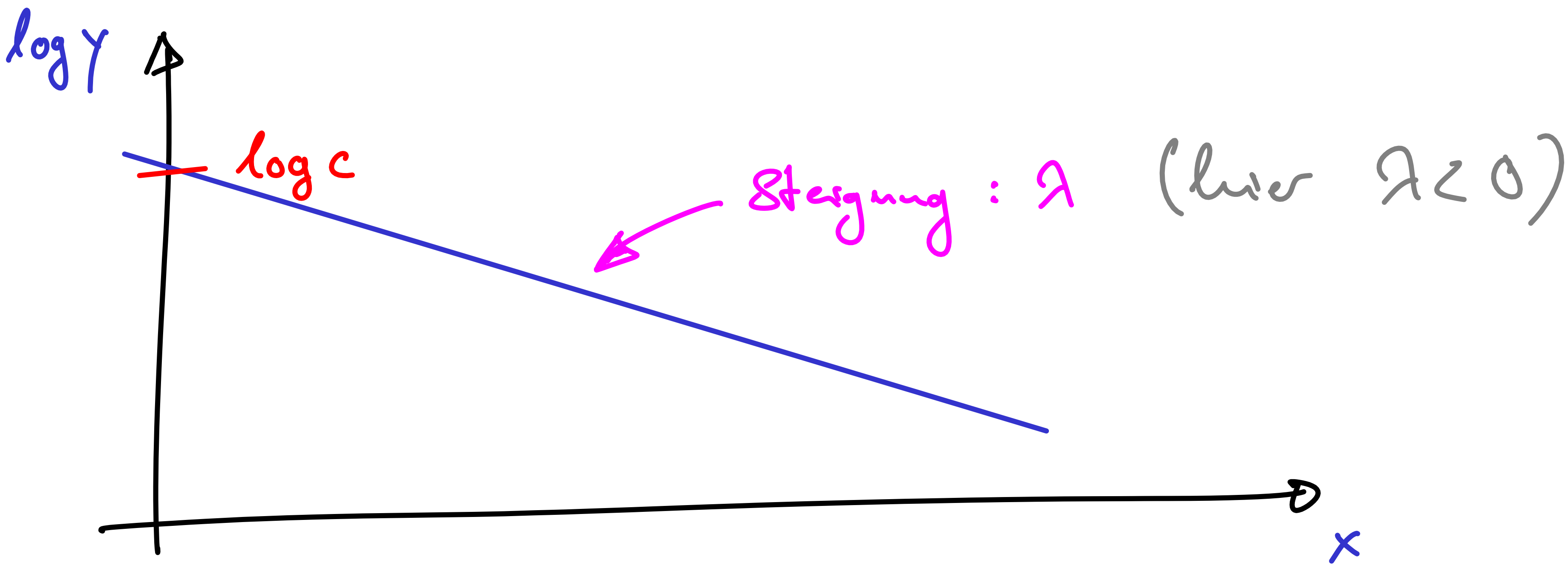
$$\log(10^n) = n \log 10$$

logarithmische y-Achse

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

$$\log y = \log(c \cdot e^{\lambda x}) = \log c + \log(e^{\lambda x})$$

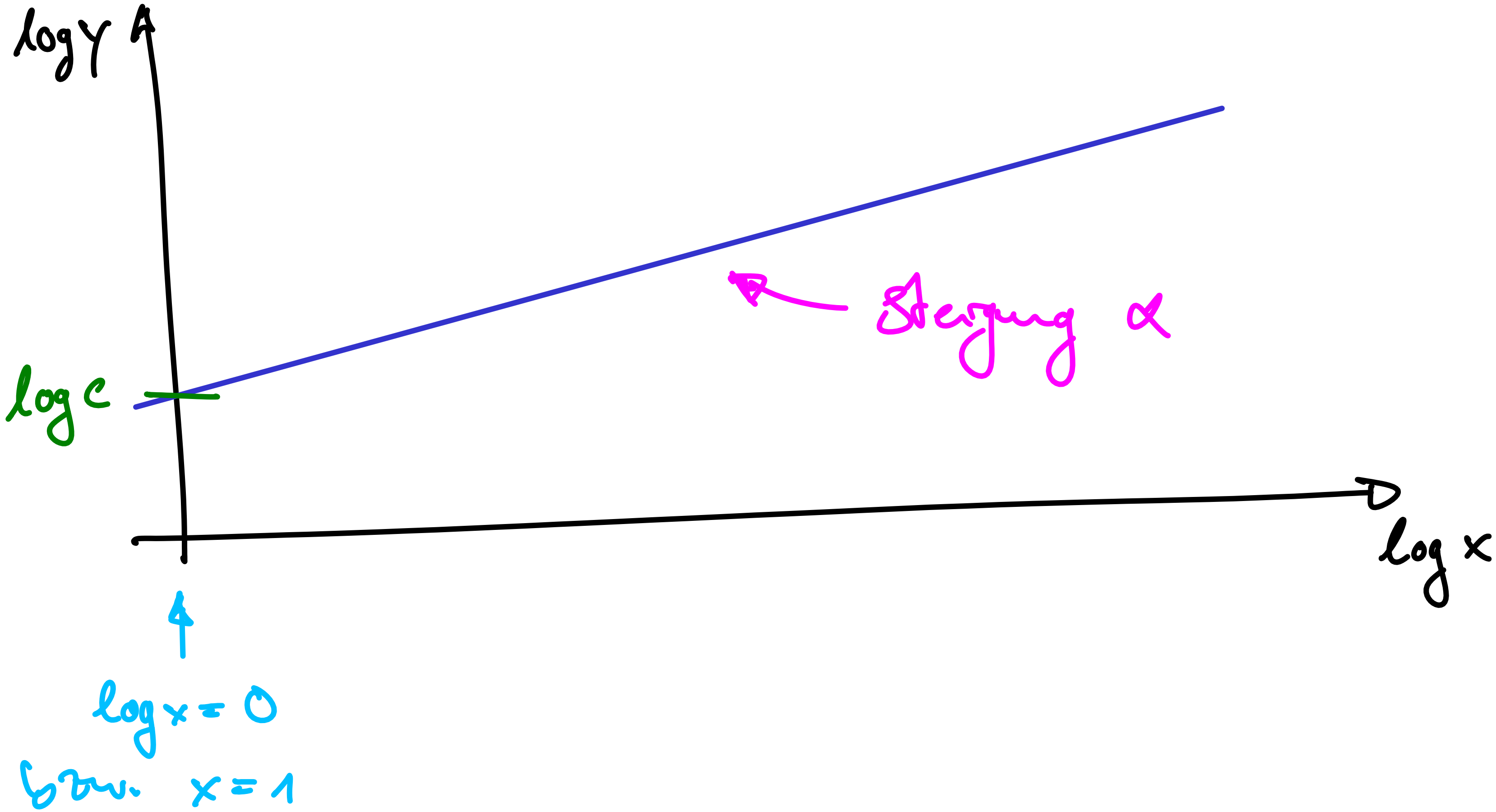
$$= \log c + \lambda x$$



doppelt logarithm. Diagramm

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

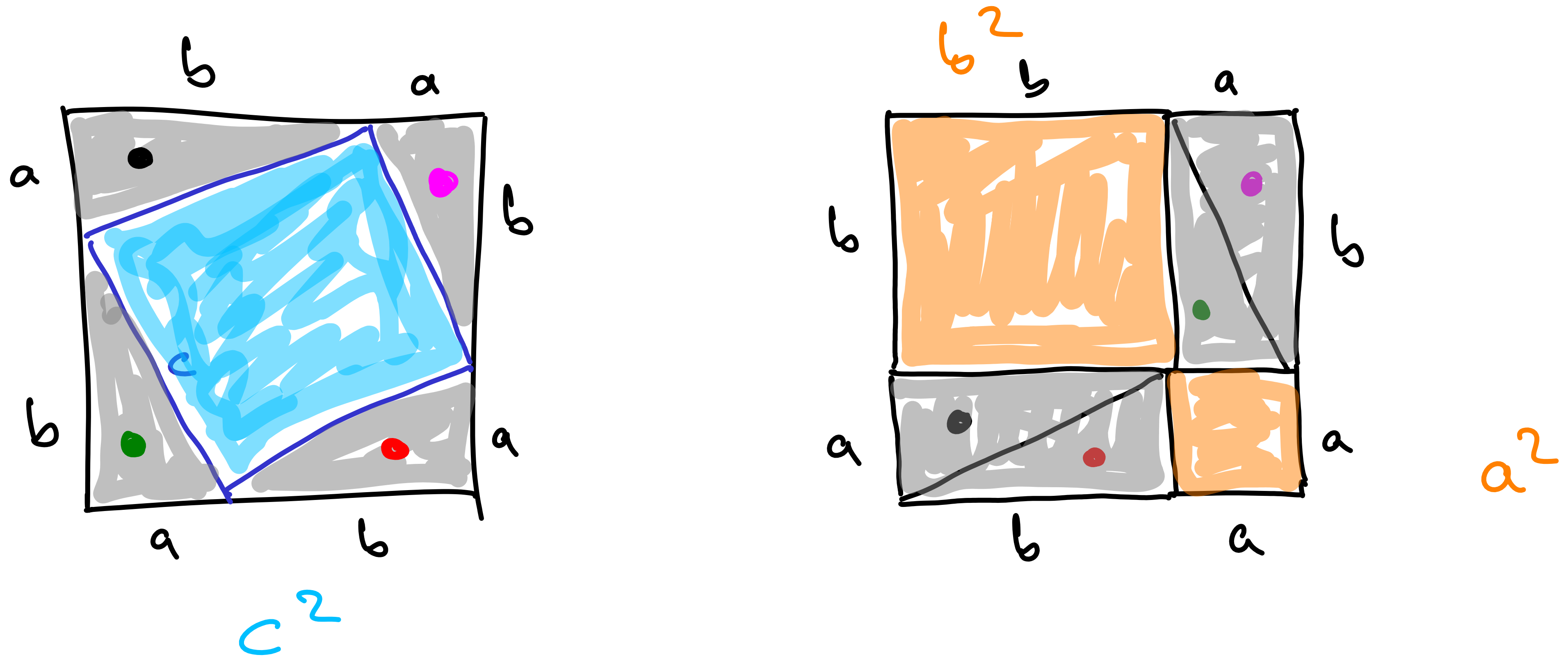
$$\log y = \log c + \log(x^{\alpha}) = \log c + \alpha \cdot \log x$$



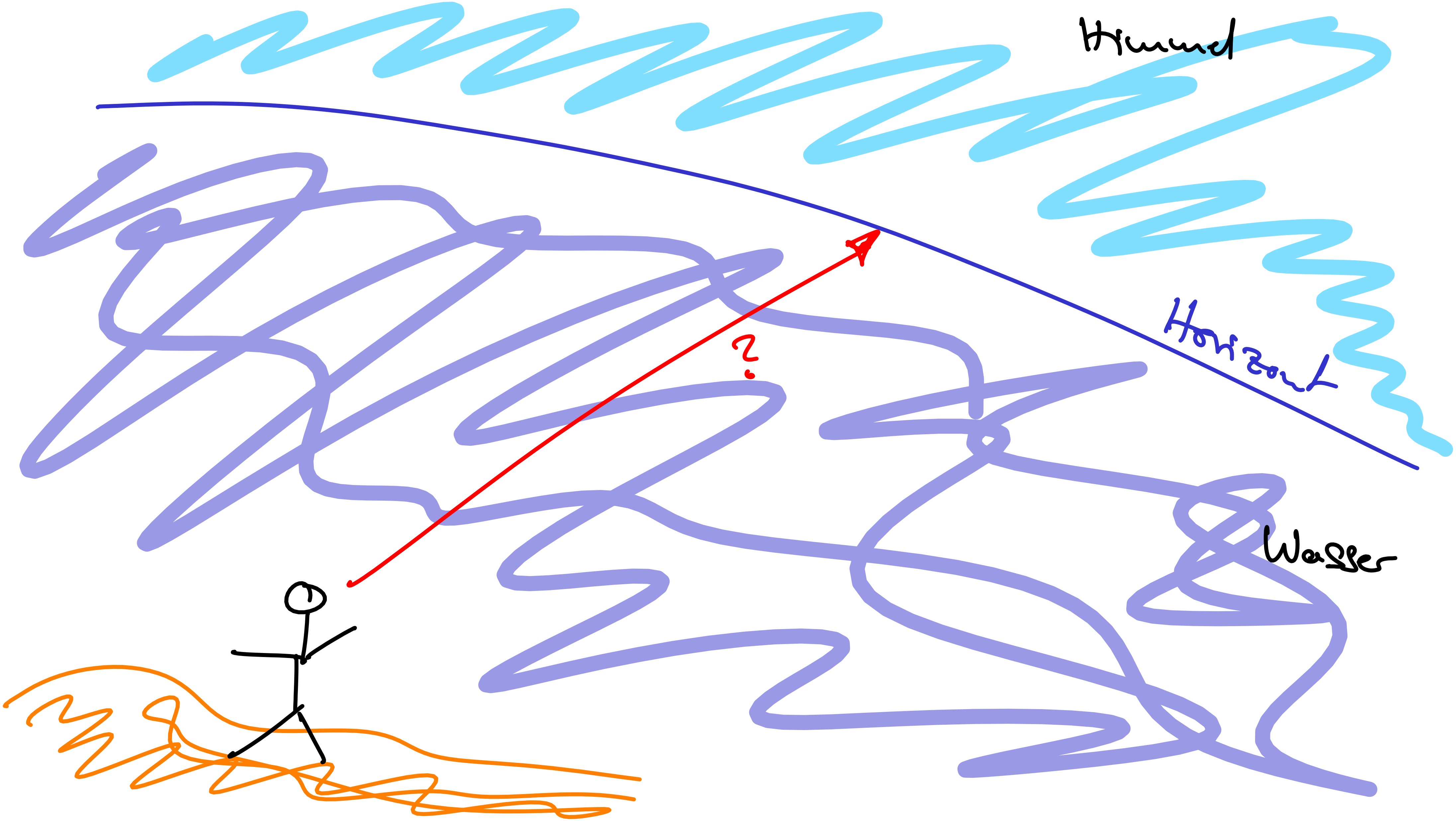
$$\log x = \log\left(\alpha^{\log_\alpha x}\right)$$

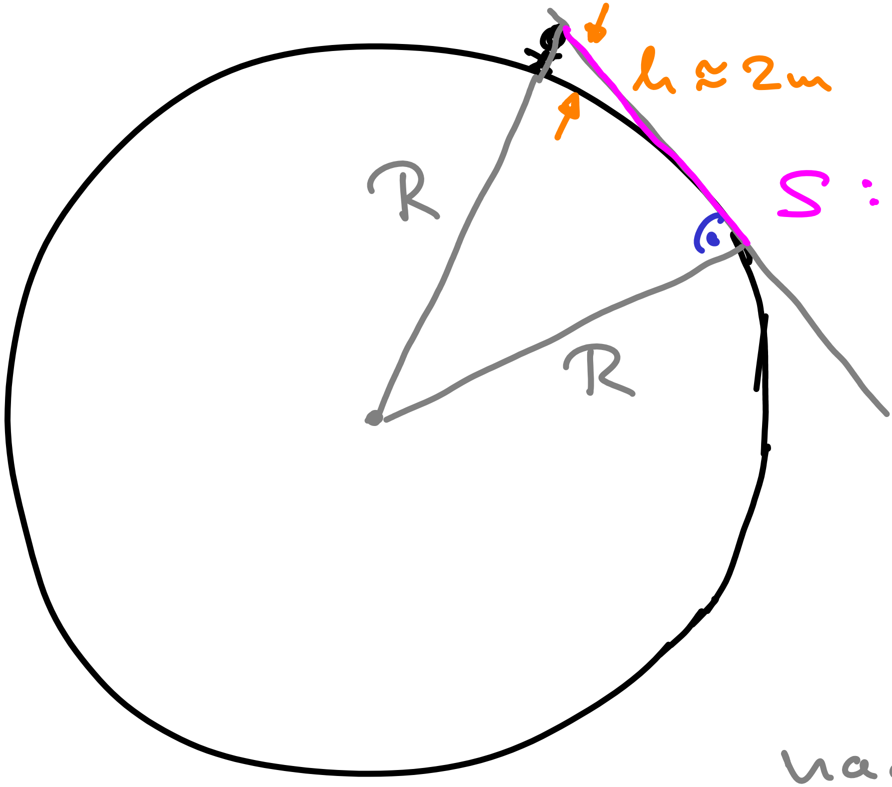
$$= \log_\alpha x \cdot \log \alpha$$

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



$$\Longrightarrow \quad c^2 = a^2 + b^2$$


Himmel
Horizont
?
Wasser



$R \approx 6400\,\text{km}$

Pythagoras

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

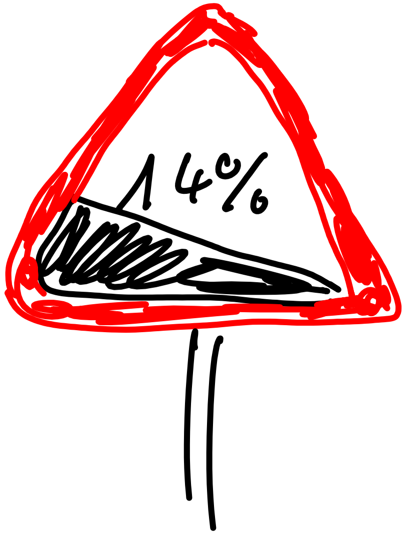
nach s auflösen, oder ....

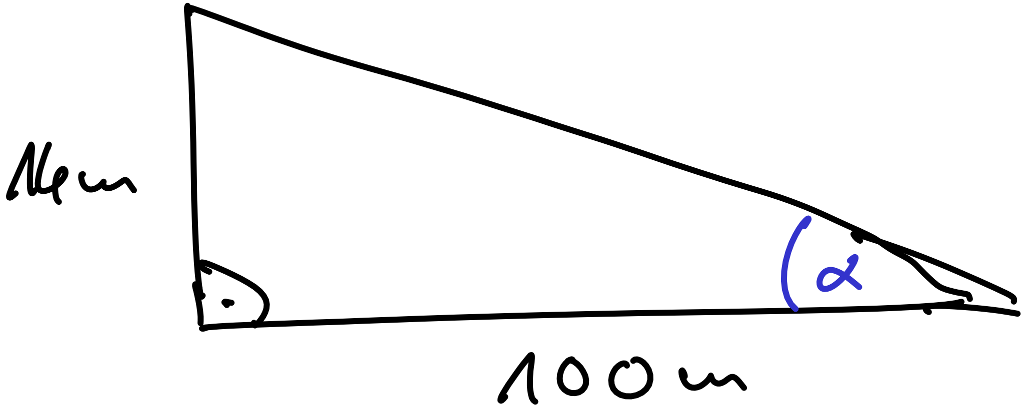
$$\cancel{R^2} + 2Rh + h^2 = \cancel{R^2} + s^2$$

winzig gegenüber 2Rh

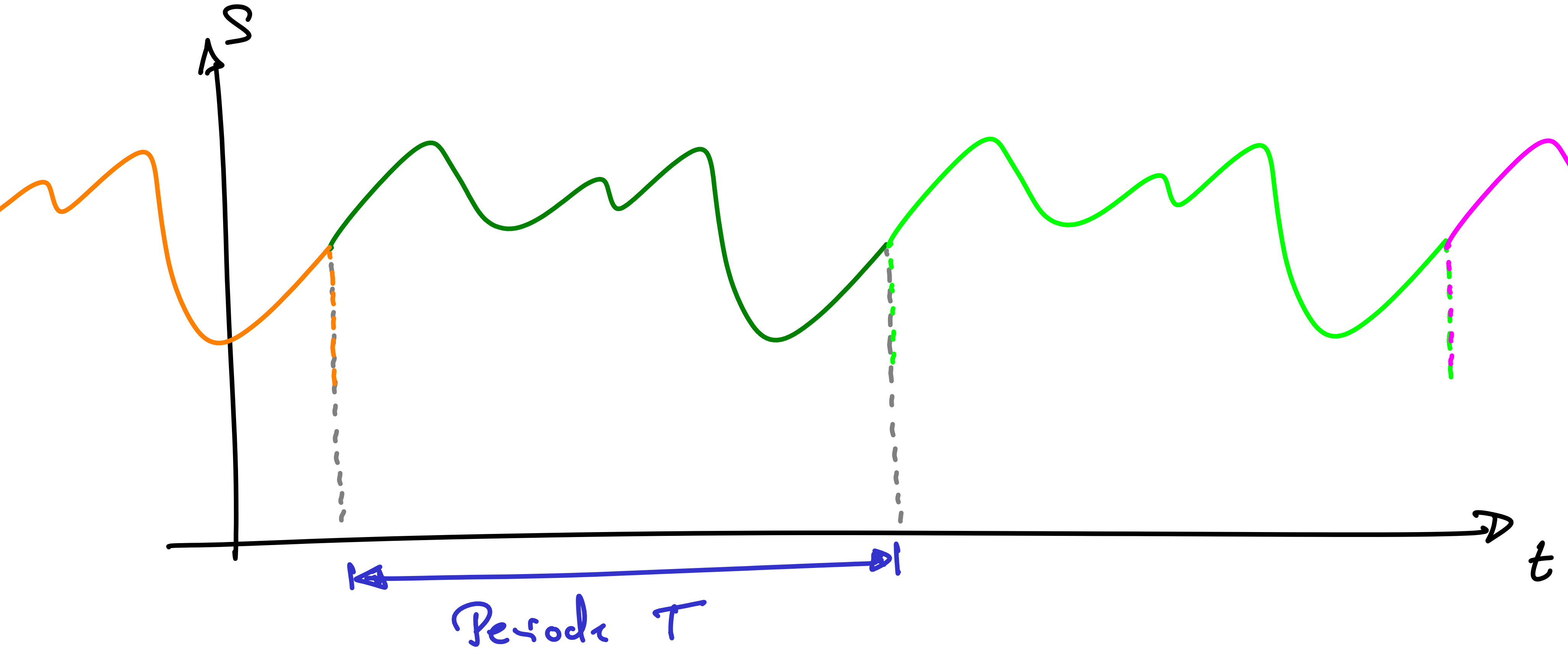
$\Rightarrow \quad s^2 \approx 2Rh$ da $h \ll R$

also $s \approx \sqrt{2Rh} = \sqrt{2 \cdot 6400\,\text{km} \cdot 2\,\text{m}} \approx \sqrt{25\,\text{km}^2} = 5\,\text{km}$





$$\tan \alpha = \frac{14\,m}{100\,m} = 0{,}14 = 14\%$$



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

später: Summe von sin- & cos-Termen

harmon. Schwingung

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

$$s(t+T) = c \sin(\omega(t+T) + \alpha)$$

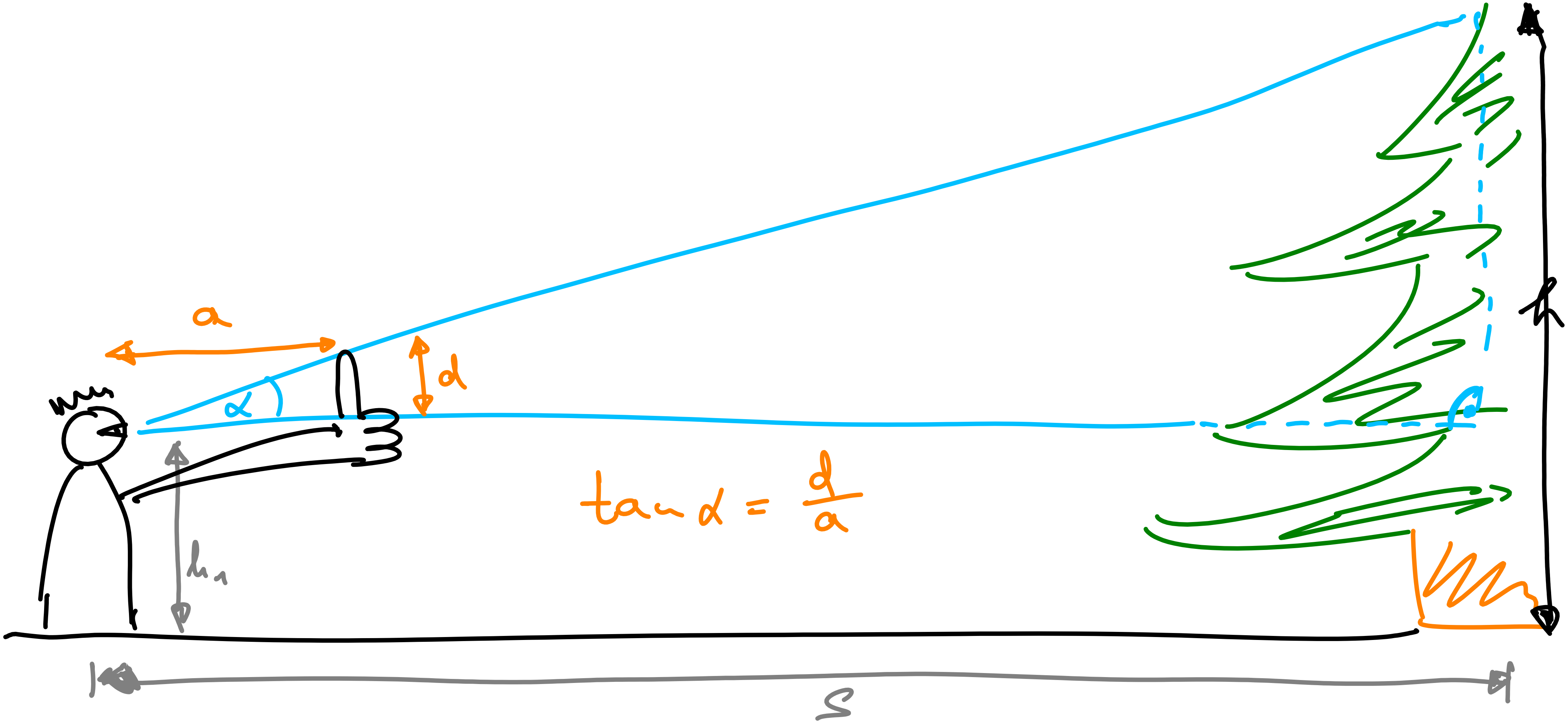
$$= c \sin(\omega t + \omega T + \alpha)$$

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

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

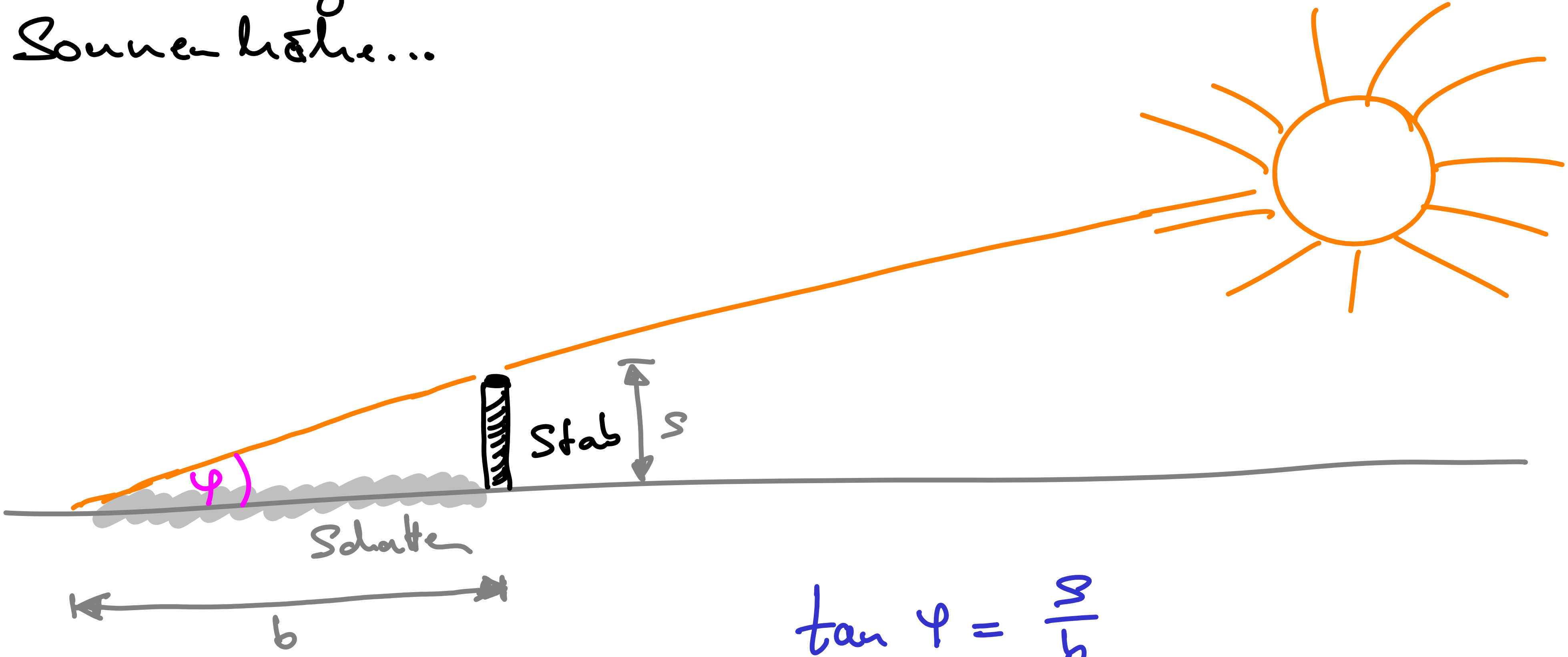
$$= c \sin(\omega t + \alpha) = s(t)$$

$$s \tan\alpha = h - h_1$$



$$h = h_1 + s \cdot \tan\alpha = h_1 + s \cdot \frac{d}{a}$$

Der Vollständigkeit halber und die Sonnenhöhe...



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

$$\Rightarrow \varphi = \arctan \frac{s}{b}$$

Tipp zu 28b: Machen Sie sich ebenfalls eine Skizze und suchen Sie nach dem Tangens eines Winkels. Der arctan liefert auch dann die Lösung.