

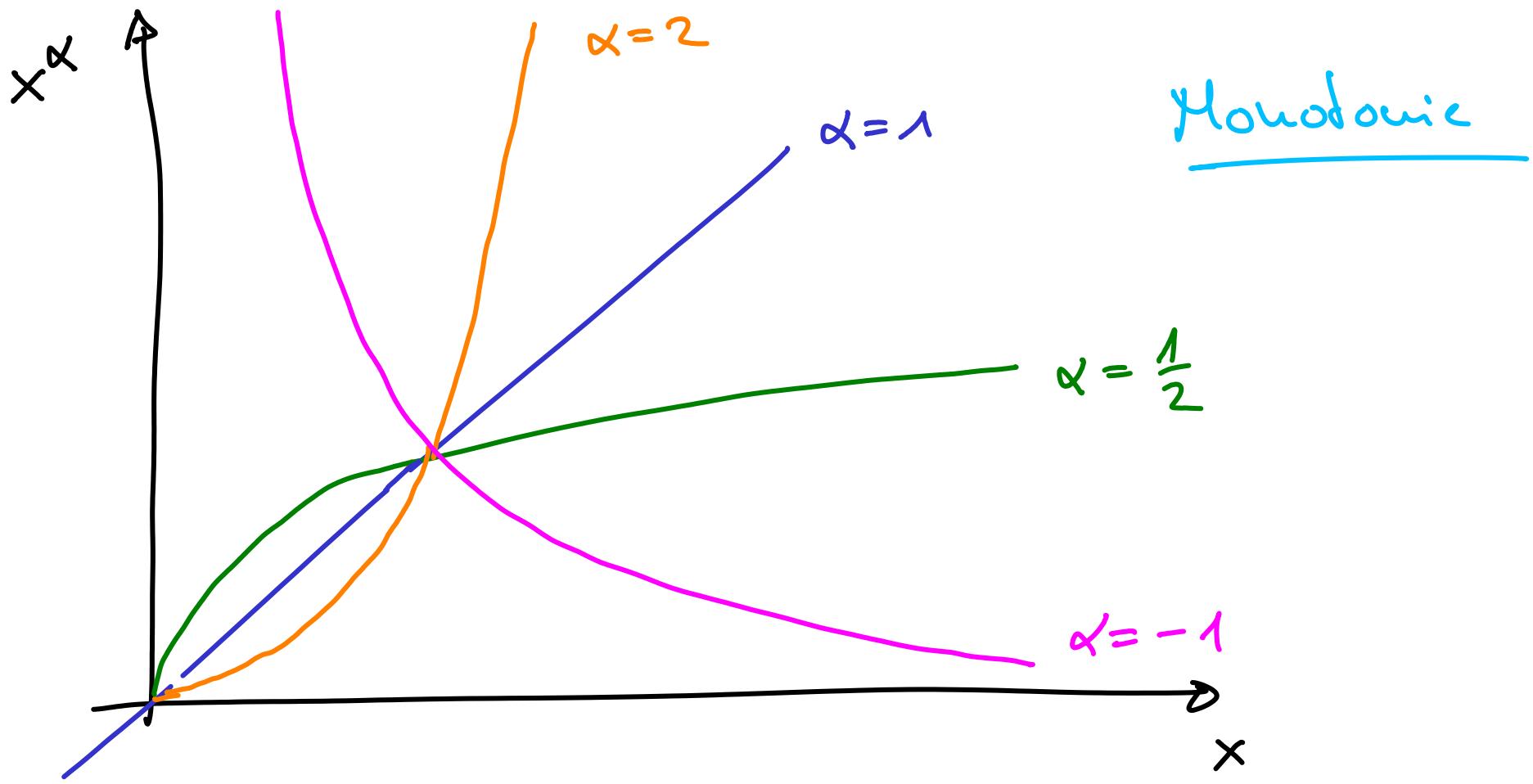
$$(x^\alpha)^\beta \neq x^{(\alpha\beta)}$$

z.B.

$$(2^2)^3 = 4^3 = 64$$

$$2^{(2^3)} = 2^8 = 256$$

$$\begin{aligned}\sqrt[3]{9^{-2} \cdot 3} &= \sqrt[3]{(3^2)^{-2} \cdot 3} = (3^{-4} \cdot 3^1)^{1/3} \\ &= (3^{-3})^{1/3} = 3^{-1} = \frac{1}{3}\end{aligned}$$



$$\alpha = 1,06 \quad (6\% \text{ Zinsen})$$

$$G(0) = 100 \text{ €}$$

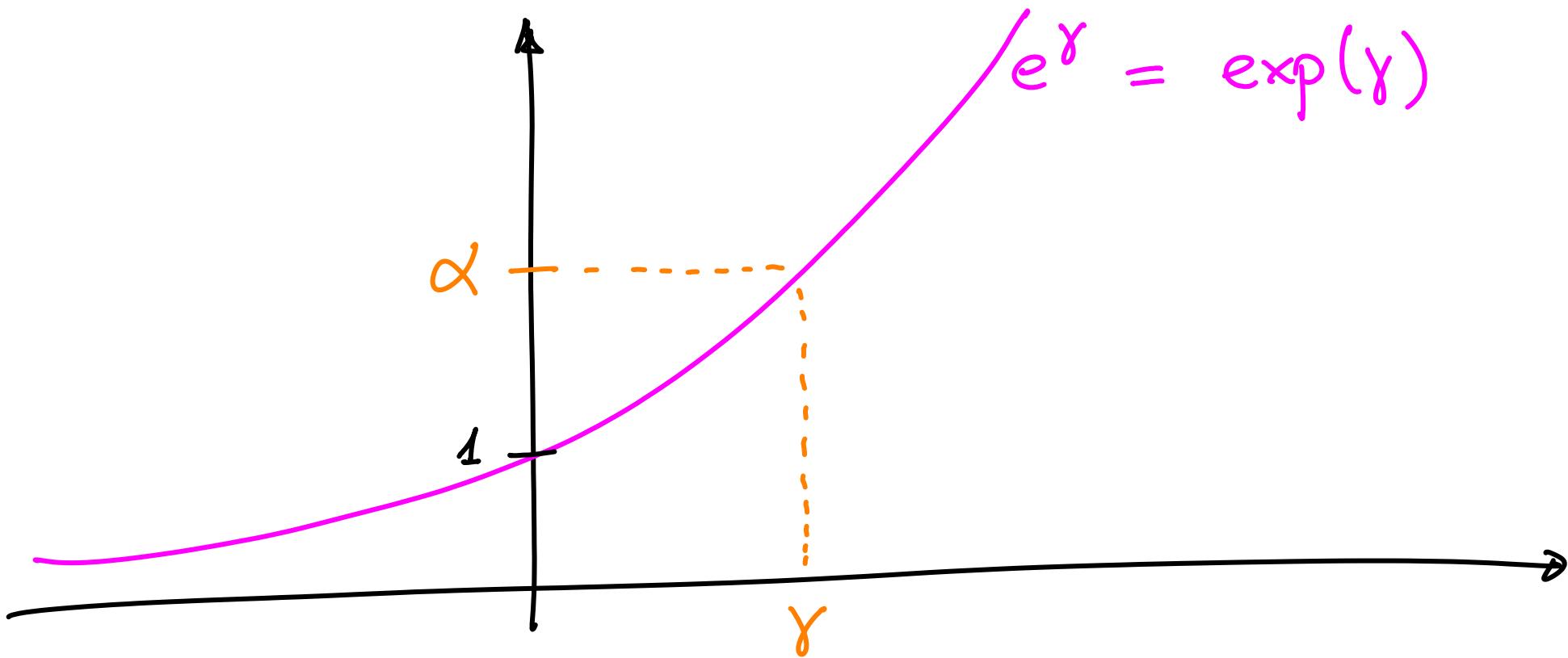
$$t = \frac{1}{2}$$

Rückzahlung nach halben Jahr

$$G\left(\frac{1}{2}\right) = (1,06)^{1/2} \cdot 100 \text{ €} \approx 102,96 \text{ €} < 103 \text{ €}$$

("Zinsseszins rückwärts")

$$\alpha^t = e^{\gamma t} = (e^\gamma)^t \quad \text{deshalb} \quad \alpha = e^\gamma$$



$$\alpha > 1 \Rightarrow \gamma > 0$$

$$\alpha < 1 \Rightarrow \gamma < 0$$

$$\alpha^{t/T} = (e^{\gamma})^{t/T} = e^{\frac{\gamma t}{T}} = e^{\lambda t}$$

$\lambda = \frac{\gamma}{T}$

$$G(t) = e^{\lambda t} G(0)$$

$$G\left(\frac{1}{\lambda}\right) = e^{\lambda \cdot \frac{1}{\lambda}} G(0) = e \cdot G(0), \quad \lambda > 0$$

$$G\left(-\frac{1}{\lambda}\right) = e^{-\lambda \frac{1}{\lambda}} G(0) = \frac{1}{e} G(0), \quad \lambda < 0$$

radioaktiver Zerfall

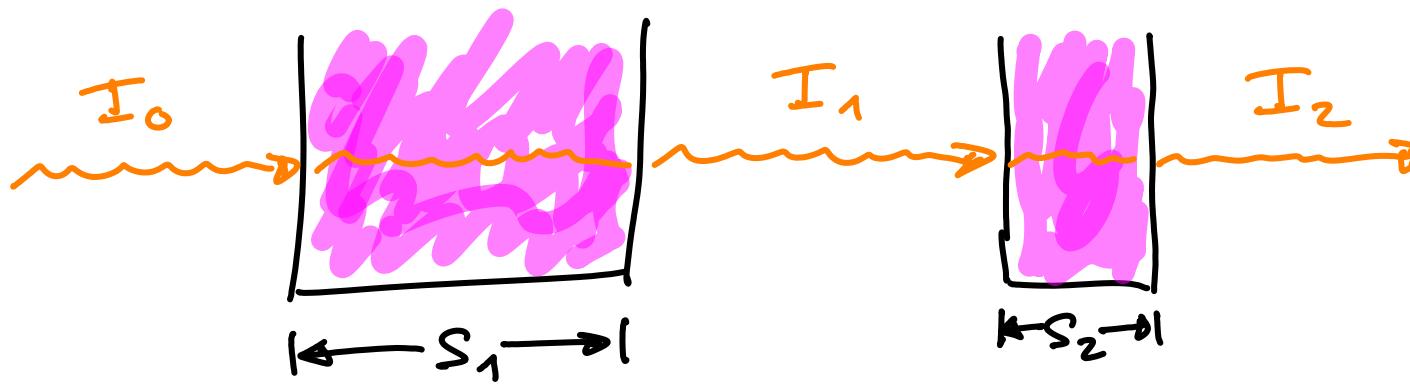
$G(t)$ Menge zu Beginn des Intervalls $[t, t+T]$

$G(t+T)$ a am Ende

$$\frac{G(t+T)}{G(t)} = \frac{e^{-\lambda(t+T)} G(0)}{e^{-\lambda t} G(0)} = e^{-\lambda T}$$

hängt nicht von t ab!

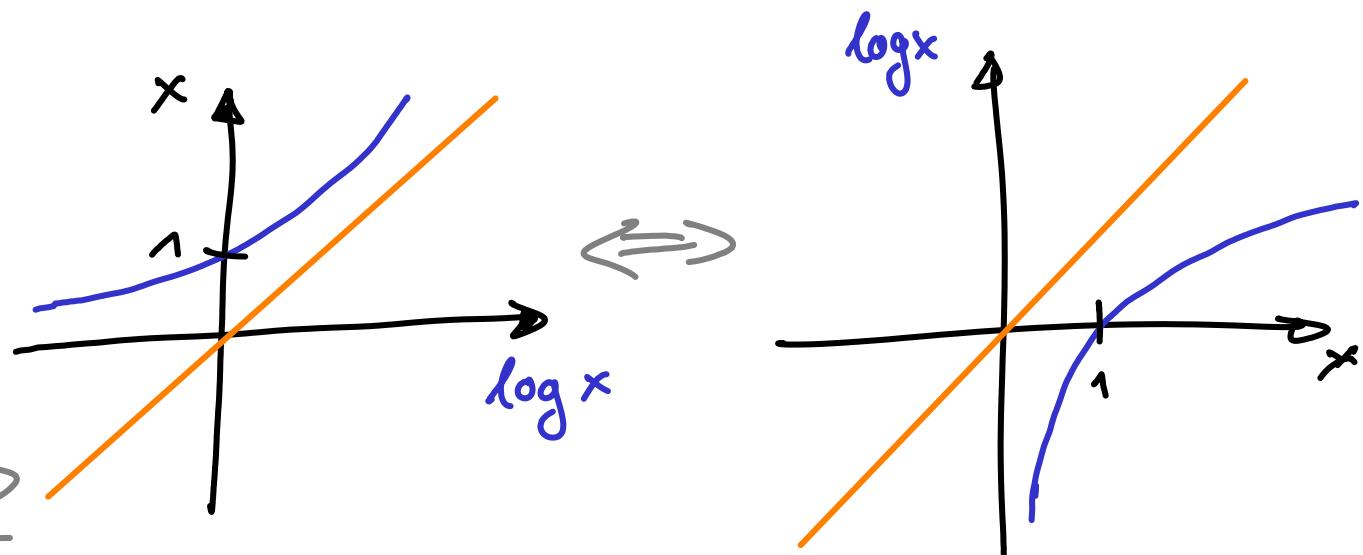
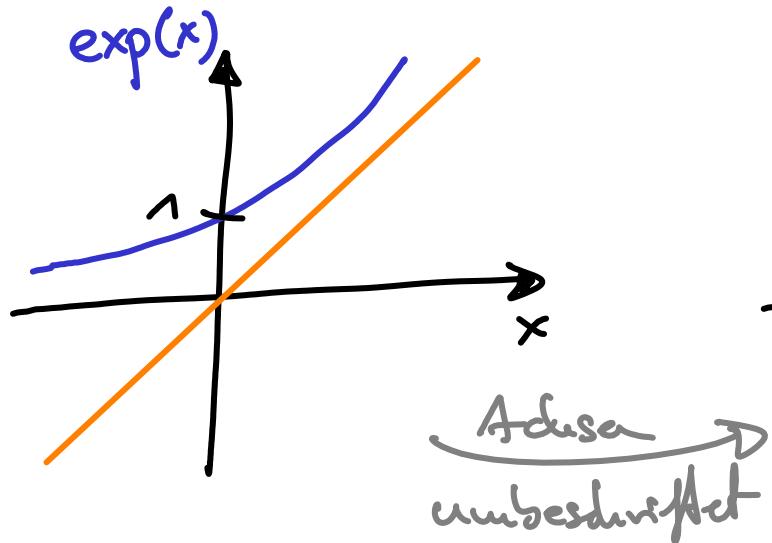
zu Lambert-Beer



$$I_1 = \underline{\alpha_{S_1} \cdot I_0}, \quad I_2 = \underline{\alpha_{S_2} I_1} = \underline{\alpha_{S_2} \cdot \alpha_{S_1} \cdot I_0}$$

This diagram shows two adjacent rectangular containers. The left one contains pink granules and is labeled S_1 . The right one is empty and labeled S_2 . An input arrow I_0 enters from the left, and an output arrow I_2 exits to the right. Below the left container, a double-headed arrow indicates its thickness is s_1 . Below the right container, a double-headed arrow indicates its thickness is s_2 . A horizontal double-headed arrow at the bottom indicates the total thickness of both samples is $s_1 + s_2$.

$$I_2 = \underline{\alpha_{S_1+s_2} I_0} \Rightarrow \underline{\alpha_{S_1+s_2}} = \underline{\alpha_{S_1} \cdot \alpha_{S_2}}$$



also gespiegelt an erste Winkelhalbierende

Log-Rechenregeln

① $\log(xy) = \log x + \log y$

$$x = e^a, y = e^b \Leftrightarrow \log x = a, \log y = b$$

$$\log(xy) = \log(e^a \cdot e^b) \stackrel{\text{P.R.}}{=} \log(e^{a+b})$$

$$\stackrel{=}{{\text{Umkehrfkt.}}} a+b = \log x + \log y$$

② $\log(x^\alpha) = \alpha \log x$

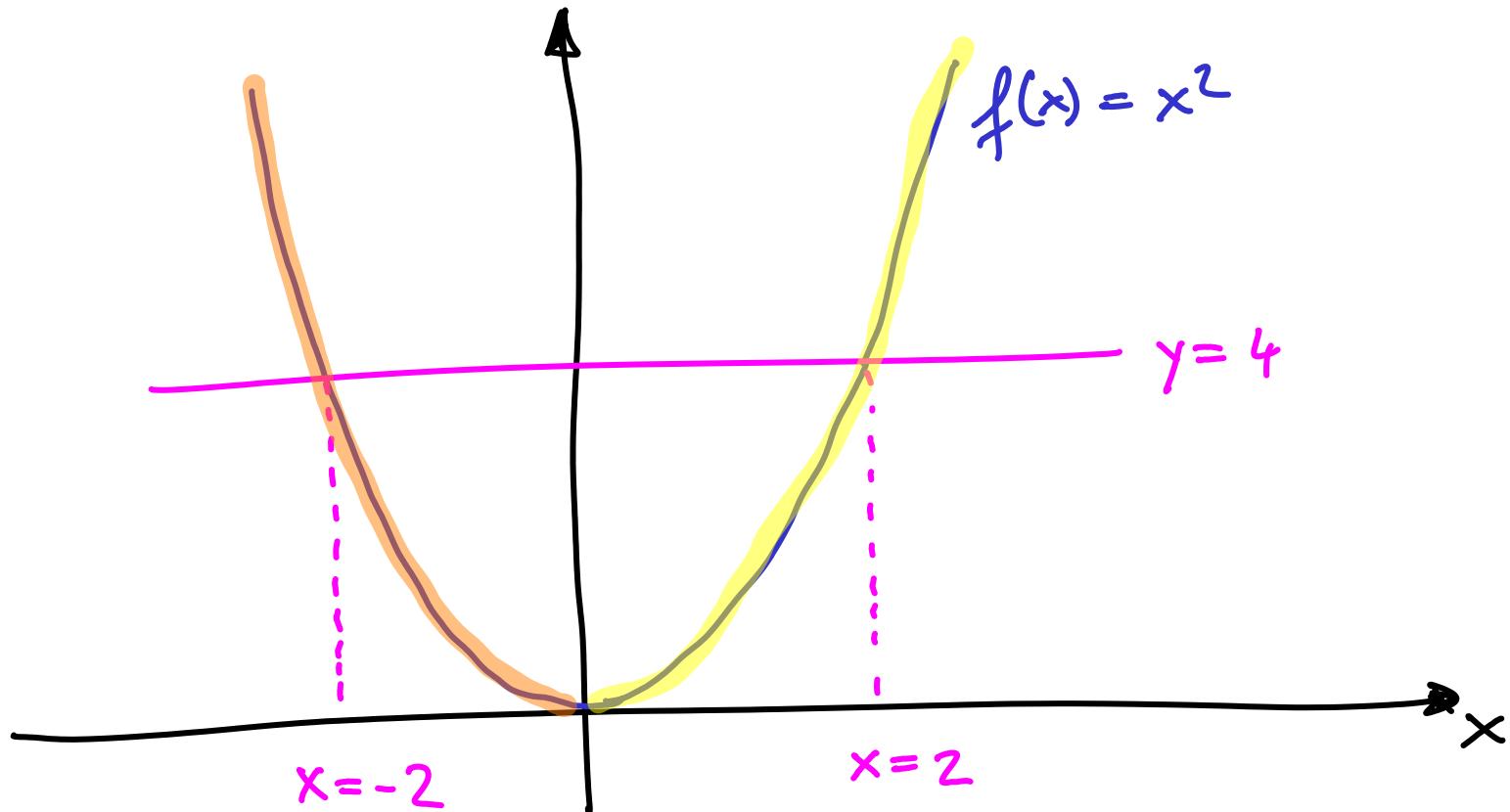
$$x = e^\gamma \Leftrightarrow \gamma = \log x$$

Umkehrfkt.

$$\begin{aligned} \log(x^\alpha) &= \log((e^\gamma)^\alpha) \stackrel{\text{P.R.}}{=} \log(e^{\gamma \cdot \alpha}) = \gamma \cdot \alpha \\ &= \alpha \cdot \log x \end{aligned}$$

$$\textcircled{3} \quad \log\left(\frac{1}{x}\right) = -\log x \quad (\textcircled{2} \text{ mit } \alpha = -1)$$

$$\textcircled{4} \quad \log(1) = \log(e^0) = 0$$



$f: \mathbb{R} \rightarrow \mathbb{R}_0^+ = [0, \infty)$ ist nicht injektiv, d.h.
 $x \mapsto x^2$ und nicht umkehrbar

$\tilde{f}: [0, \infty) \rightarrow [0, \infty)$ ist umkehrbar mit
 $x \mapsto x^2$ $\tilde{f}^{-1}: y \mapsto \sqrt[n]{y}$
 $[0, \infty)$

$$\tilde{f}: (-\infty, 0] \rightarrow [0, \infty)$$
$$x \mapsto x^2$$

ist umkehrbar mit $\tilde{f}^{-1}(y) = -\sqrt{y}$

$$\tilde{f}^{-1}: [0, \infty) \rightarrow (-\infty, 0]$$