

# Aufgabenblatt 5

[blattMMI5.pdf](#)

## Aufgabe 1

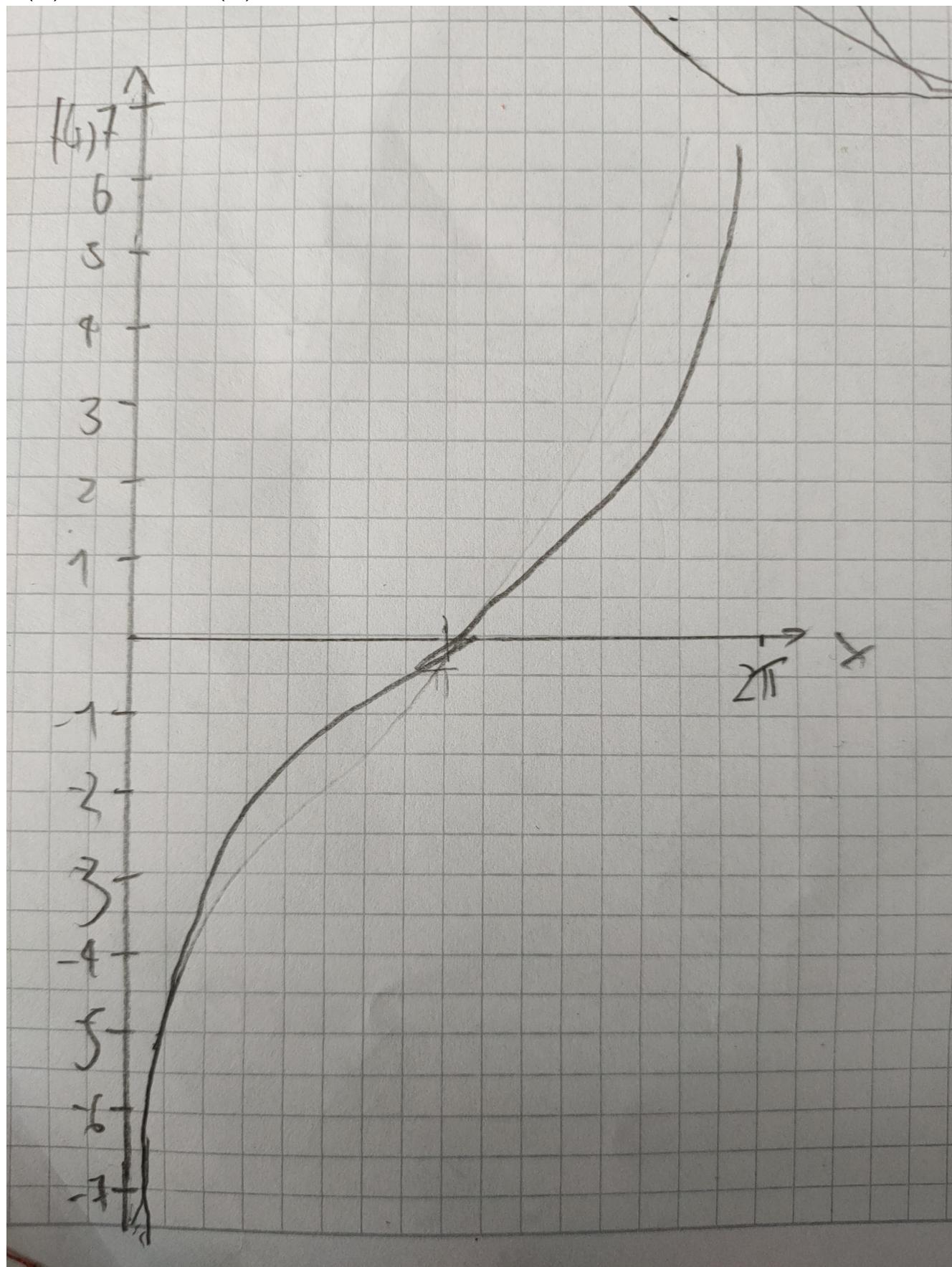
a)

$$\mathbb{W} = \{y \mid \lim_{x \searrow -\frac{\pi}{2}} \frac{\sin(x)}{\cos(x)} \leq y \leq \lim_{x \nearrow \frac{\pi}{2}} \frac{\sin(x)}{\cos(x)}\} = \{y \mid -\infty \leq y \leq \infty\}$$

$$y = \tan\left(\frac{x-\pi}{2}\right)$$

$$2\arctan(y) + \pi = x$$

$$g(x) = 2\arctan(x) + \pi$$



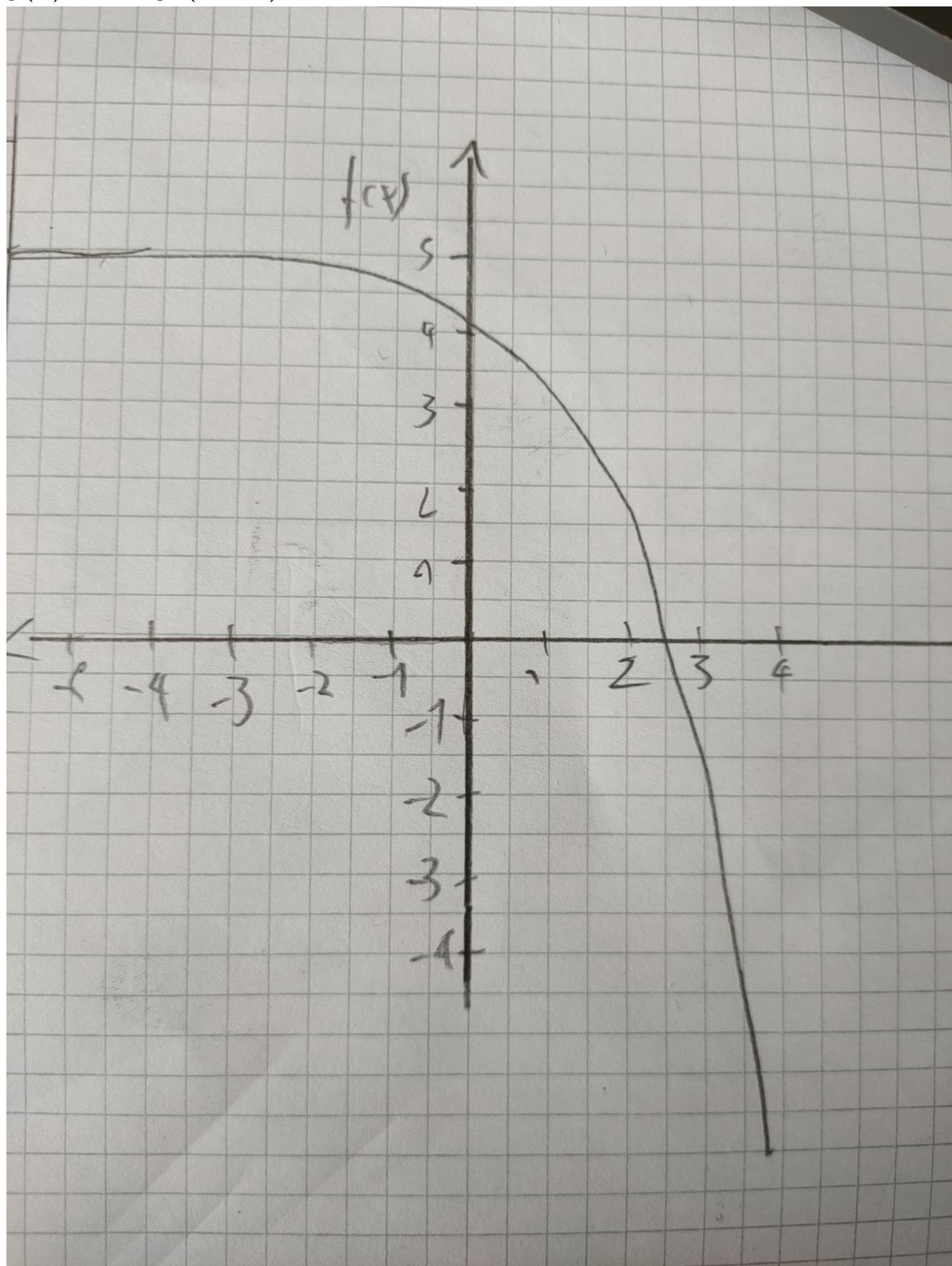
b)  $\mathbb{W} = \{y | (5 - 2^0) \leq y < \lim_{x \rightarrow \infty} 5 - 2^x\} = \{y | 4 \leq y < 5\}$

$$y = 5 - 2^{-x}$$

$$y + 5 = 2^{-x}$$

$$-\log_2(y+5) = x$$

$$g(x) = -\log_2(x+5)$$



## Aufgabe 2

$$1. \lim_{x \rightarrow \infty} \frac{x - \sqrt{5x^2 - 3}}{4 + x^2} = /x^2 \lim_{x \rightarrow \infty} \frac{\frac{1}{x} - \sqrt{5} - \frac{3}{x^2}}{\frac{4}{x^2} + 1} = \frac{0 - \sqrt{5} - 0}{0 + 1} = -\sqrt{5}$$

$$2. \lim_{x \rightarrow \infty} \frac{3 - 2x - 10x}{1 + 10^x} = /10^x \frac{\frac{3}{10^x} - \frac{2}{10^x} - 1}{\frac{1}{10^x} + 1} = \frac{0 - 0 - 1}{0 + 1} = -1$$

$$3. \lim_{x \rightarrow 0} \frac{\tan(x)}{x} = \frac{\lim_{x \rightarrow 0} \tan(x)}{\lim_{x \rightarrow 0} x} = \frac{0}{0} = 1$$

$$4. \lim_{x \rightarrow \infty} \arctan\left(\frac{x^2 - x^3 + 1}{x^2 + x}\right) = \lim_{x \rightarrow \infty} \arctan\left(\frac{\frac{1}{x} - 1 + \frac{1}{x^3}}{\frac{1}{x} + \frac{1}{x^2}}\right)$$

$$\lim_{x \rightarrow \infty} \frac{\frac{1}{x} - 1 + \frac{1}{x^3}}{\frac{1}{x} + \frac{1}{x^2}} = -1$$

$$\arctan(-1) = -\frac{\pi}{4}$$

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## Aufgabe 3

a)  $f(x) = -(x - 3)\left(\frac{1}{-x^2 * x - 1} + \frac{1}{(x-1)^2} + \frac{1}{x+1}\right)$

b)  $\left(1 + \left(\sum_{n=1}^{100} \frac{9}{10^n}\right)\right) \cdot e^{-(x-1)^2}$  \*\*Bin mir nicht sicher ob das korrekt ist, da  $1.\bar{9} = 2$  ist...

c)  $f(x) = 3\sin(13x)$

d)  $f(x) = 4e^{-x^{0.5}} + 1$