S. 103 Nr. 1)

$$f(x) = \frac{3(x-1)(x+1)(x-5)}{-2(x+1)(x-5)(x-2)} \quad ; \quad \mathbb{D} = \mathbb{R} \setminus \{-1; 2; 5\}$$

$$f_e(x) = \frac{3(x-1)}{-2(x-2)} = \frac{3x-3}{-2x+4} \qquad \mathbb{D} = \mathbb{R} \setminus \{2\}$$

$$\lim_{x \to -1} f(x) = f_e(-1) = -1$$

$$\lim_{x \to 5} f(x) = f_e(5) = -2$$

Hebbare Lücke

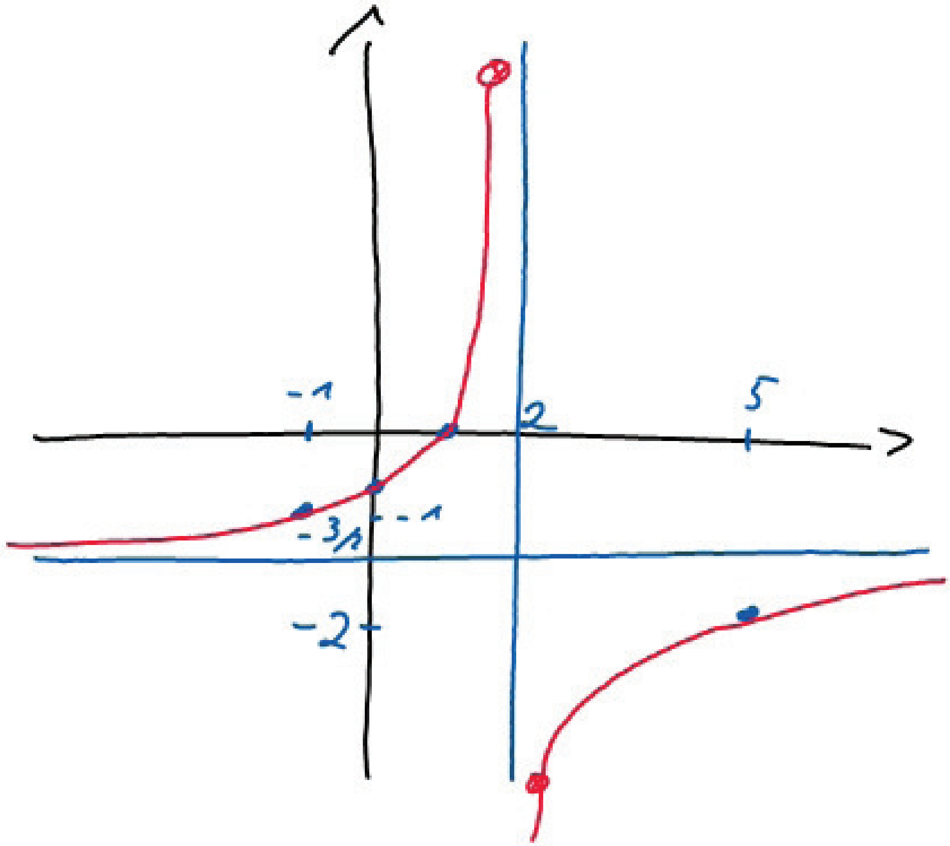
$$\lim_{x \to 2^+} f_e(x) = \frac{3}{-2 \cdot 0^+} = -\infty$$

$$\lim_{x \to 2^-} f_e(x) = \frac{3}{-2 \cdot 0^-} = \left[\frac{3}{0^+}\right] = \infty$$

senkrechte Asy.

$$\lim_{x\to\infty} \frac{3x-3}{-2x+4} = \lim_{x\to\infty} \frac{\cancel{x}\,(3-\underbrace{3/x}_{\to 0})}{\cancel{x}\,(-2+\underbrace{4/x}_{\to 0})} = -3/2$$ waagerechte Asy.

$$\lim_{x\to -\infty} f(x) = -3/2$$



Achsenschnittpunkte:

$f(x)=0 \qquad 3x-3=0$

$x = 1$

$(1|0)$

$f(0) = -3/4$

$$\lim_{x \to 2} (x^2 - 4 + 2x) = 4$$

S. 109 Nr. 2

$$f(x) = \begin{cases} ax + b & ; \; x < 1 \\ x - a \cdot x^2 & ; \; x \geq 1 \end{cases} \qquad f'(x) = \begin{cases} a & ; \; x < 1 \\ 1 - 2ax & ; \; x \geq 1 \end{cases}$$

$$\left.\begin{aligned} &\lim_{x \to 1^+} f(x) = f(1) = 1 - a \\ &\lim_{x \to 1^-} f(x) = a + b \end{aligned}\right\} \Rightarrow \quad 1 - a = a + b$$

$$b = 1 - 2a$$

$$b = 1/3$$

$$\left.\begin{aligned} &\lim_{x \to 1^+} f'(x) = f'(1) = 1 - 2a \\ &\lim_{x \to 1^-} f'(x) = a \end{aligned}\right\} \quad 1 - 2a = a$$

$$a = 1/3$$

S 113 Nr. 1)

$$f(x) = -2x^6 + \tfrac{1}{2}x^2 - 7$$
$$f'(x) = -12x^5 + x$$
$$f''(x) = -60x^4 + 1$$

$$f(-x) = -2(-x)^6 + 0{,}5\cdot(-x)^2 - 7$$
$$\swarrow$$
$$f(x) \Rightarrow \text{Achsensymm.}$$

Nr. 2)

$$f(x) = 2\cdot x^{-4/3} - x^{2/5}$$
$$f'(x) = -\tfrac{8}{3}x^{-7/3} - \tfrac{2}{5}x^{-3/5} = -\frac{8}{3\cdot\sqrt[3]{x^7}} - \frac{2}{5\cdot\sqrt[5]{x^3}}$$
$$f''(x) = \tfrac{56}{9}x^{-10/3} + \tfrac{6}{25}x^{-8/5} \rightarrow = \frac{56}{9\sqrt[3]{x^{10}}} + \frac{6}{25\sqrt[3]{x^8}}$$

$$f(-x) = \frac{2}{\sqrt[3]{(-x)^4}} - \sqrt[5]{(-x)^2} = \frac{2}{\sqrt[3]{x^4}} - \sqrt[5]{x^2} = f(x)$$

Achsensymm.

3)

$$f(x) = 5 \cdot x^{-5} - 6x^{-1}$$

$$f'(x) = -25x^{-6} + 6x^{-2} = -\frac{25}{x^6} + \frac{6}{x^2}$$

$$f''(x) = 150x^{-7} - 12x^{-3} \rightarrow \frac{150}{x^7} - \frac{12}{x^3}$$

$$f(-x) = \frac{5}{(-x)^5} - 2 \cdot \frac{3}{(-x)} = -\frac{5}{x^5} + 2 \cdot \frac{3}{x} \neq f(x)$$

$$-f(-x) = -\left(-\frac{5}{x^5} + 2\frac{3}{x}\right) = \frac{5}{x^5} - 2 \cdot \frac{3}{x} = f(x)$$

Methodik

$\Rightarrow$ Punktsymmetrie

$f(x) = f(-x)$

J ↙ ↘ N

Achsen

$-f(-x) = f(x)$

J ↙ ↘

Punkt

keine Sym.