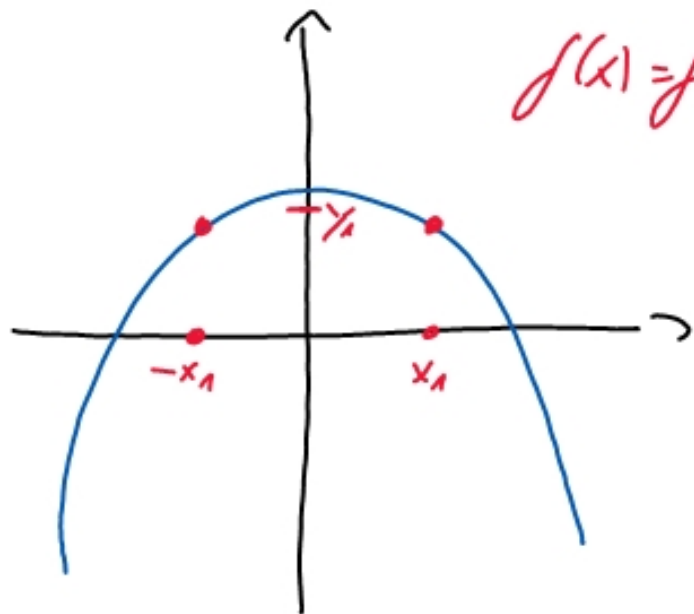
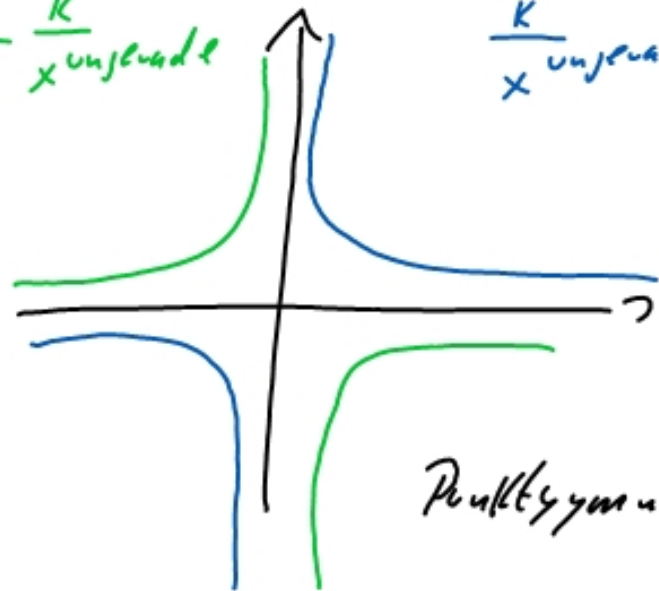


$$f(x) = f(-x)$$

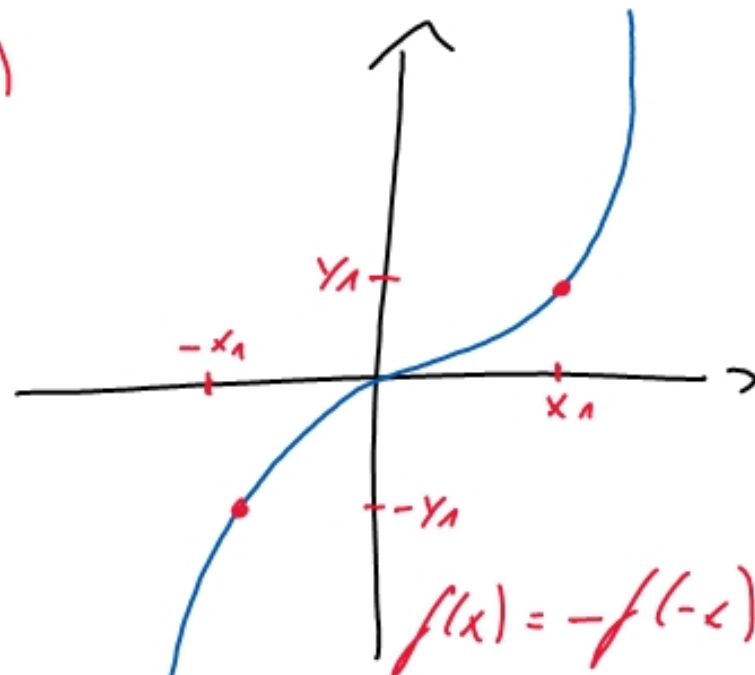


$$-\frac{k}{x} \text{ ungerade}$$



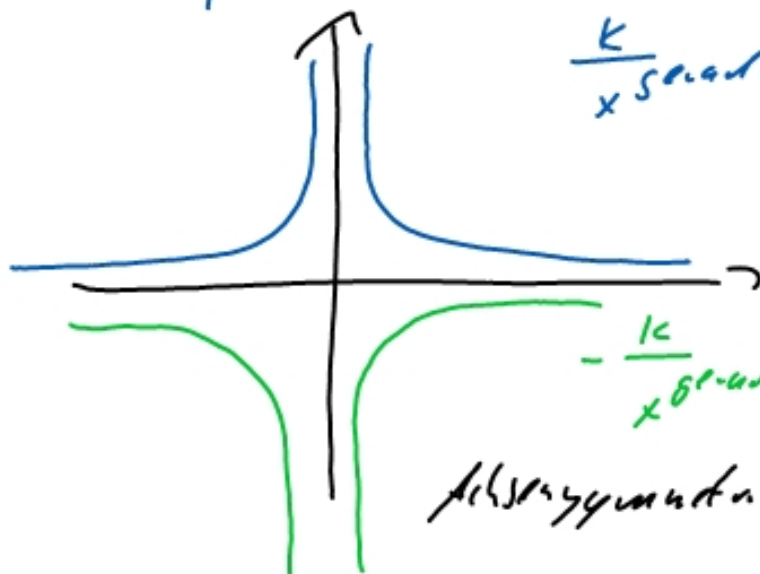
Punktsymmetrie

$$\frac{k}{x} \text{ ungerade}$$



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

$$\frac{k}{x} \text{ gerade}$$



$$-\frac{k}{x} \text{ gerade}$$

Achsensymmetrie

1) 2) 3) a) I)

$$1) \sqrt[3]{\sqrt{a^4} \sqrt[3]{a^3} \sqrt[3]{a^2} a^2} = \left( (a^4)^{\frac{1}{2}} \right)^{\frac{1}{3}} \left( (a^3)^{\frac{1}{3}} \right)^{\frac{1}{3}} \left( (a^2)^{\frac{1}{3}} \right)^{\frac{1}{3}} (a^2)^{\frac{1}{3}}$$

$$a^{\frac{2}{3}} a^{\frac{1}{4}} a^{\frac{1}{18}} a^{\frac{2}{3}} = a^{\frac{24+9+2+24}{36}} = a^{\frac{59}{36}} = \sqrt[36]{a^{59}}$$

$$2) \frac{3(2x^{-2}y^{-3})^2}{2^2(3a^3b^{-2})^3} \cdot \frac{2^3(3a^4b^{-3})^2}{3^2(2x^{-1}y^{-2})^3}$$

$$\frac{3 \cdot 2^2 x^{-4} y^{-6}}{2^2 \cdot 3^3 a^9 b^{-6}} \cdot \frac{2^3 \cdot 3^2 a^8 b^{-6}}{3^2 \cdot 2^3 x^{-3} y^{-6}}$$

$$\frac{3^2 \cdot 2^5}{3^5 \cdot 2^5} \cdot \frac{a^8 b^6 x^3 y^6}{x^4 y^6 a^9} = \frac{1}{9} \frac{1}{ax}$$

$$3) \frac{42}{\sqrt[4]{x^{10}}} \cdot \frac{(\sqrt[4]{x})^{3-2n}}{2^4 \sqrt{x^{4n-6}}} \cdot \left( \frac{(\sqrt[4]{x})^{2n+5}}{2^{1/2} \sqrt{x^{6-4n}}} \right)^2$$

$$\frac{42}{x^{10/4}} \cdot \frac{x^{\frac{6-4n}{4}}}{x^{\frac{4n-6}{2n}}} \cdot \frac{x^{\frac{4n+10}{4}}}{x^{\frac{24-4n}{4}}}$$

$$42 \cdot x^{\frac{-10+6-4n-(2n-3)+4n+10-(24-4n)}{4}}$$

$$42 \cdot x^{\frac{-15+2n}{4}} = 42 \cdot x^{-\frac{15}{4}} \cdot x^{\frac{2n}{4}} = 42 \cdot \frac{x^2}{\sqrt[4]{x^{15}}}$$

$$a) (\sqrt[12]{x^6})^3 = 64 \Leftrightarrow (x^{1/2})^3 = 2^6 \Leftrightarrow x^{3/2} = 2^6 \uparrow^{2/3}$$

$$x = (2^6)^{2/3} = 2^4 = 16$$

$$I) f(x) = \sqrt[3]{\frac{3}{x-2}}; \mathbb{D} = x \in \mathbb{R} \setminus \{2\}; \mathbb{W} = y \in \mathbb{R} \setminus \{0\}$$

## logarithmus

$$a^x = b$$

| log

$$a^x = b \Leftrightarrow x = \log_a b$$

$$x \cdot \log a = \log b \quad | : \log b$$

$$x = \log_5 25 \quad 5^x = 25$$

$$x = 2$$

$$x = \frac{\log b}{\log a}$$

$$x = \log_5 -25 \quad 5^x = -25 \quad \downarrow$$

$$x = \log_5 0 \quad 5^x = 0 \quad \downarrow$$

$$x = \log_{10} 100.000$$

$$10^x = 100.000 = 10^5$$

$$x = 5$$

$$x = \log_5 100 \quad 5^x = 100$$

$$5^2 = 25 \quad 5^3 = 125$$

$$x = \log_2 0,125$$

$$2^x = 0,125 = \frac{1}{8} = \frac{1}{2^3} = 2^{-3}$$

$$x = -3$$

$$2) \quad 2 \cdot \ln 2x - 3 \cdot \ln 2 + 4 \cdot \ln \sqrt{x} + 2 \cdot \ln \left(\frac{4}{x}\right)$$

$$\ln (2x)^2 - \ln 2^3 + \ln (\sqrt{x})^4 + \ln \left(\frac{4}{x}\right)^2$$

$$\ln \frac{4x^2 \cdot x^2 \cdot \frac{16}{x^4}}{8} = \ln (8)$$

$$4) \quad \ln \left( \frac{2 \cdot \sqrt{a-25}}{c^2 \cdot \sqrt[4]{d}} \right)^3$$

$$3 \cdot \left[ \ln 2 + \ln \sqrt{a-25} - \ln c^2 - \ln \sqrt[4]{d} \right]$$

$$3 \cdot \ln 2 + \frac{3}{2} \ln (a-25) - 6 \cdot \ln c - \frac{3}{4} \ln d$$