

S 138

$$1) (2x^2 - \sqrt{x})^4$$

$$1(2x^2)^4(-\sqrt{x})^0 + 4(2x^2)^3(-\sqrt{x})^1 + 6(2x^2)^2(-\sqrt{x})^2 + 4(2x^2)^1(-\sqrt{x})^3 + 1(2x^2)^0(-\sqrt{x})^4$$

$$16x^8 - 32x^6 \cdot x^{1/2} + 24x^4 \cdot x - 8x^2 \cdot x^{3/2} + x^2$$

$$16x^8 - 32x^{13/2} + 24x^5 - 8x^{7/2} + x^2$$

$$\left(\frac{1}{2}x + x^3\right)^2 = \frac{1}{4x^2} + x^2 + x^6$$

$$\Rightarrow 16x^8 - 32\sqrt{x^{13}} - x^6 + 24x^5 - 8\sqrt{x^7} - \frac{1}{4x^2}$$

$$2) \sqrt[4]{\sqrt[3]{y^5}} \cdot (y^3)^2 : \sqrt[3]{y^2} \cdot \frac{1}{\sqrt[3]{y^6}} = y^{5/12} \cdot y^6 \cdot \frac{1}{y^{2/3}} \cdot \frac{1}{y^{6/3}}$$

$$y^{5/12 + 6 - 2/3 - 2}$$

$$= y^{\frac{5+72-8-24}{12}}$$

$$= y^{45/12} = y^{15/4} = \sqrt[4]{y^{15}}$$

$$3) \left[ \sqrt{x} \cdot \left( x^4 - \frac{1}{3\sqrt{x^2}} \right) - \frac{1}{x^2} \cdot \left( (x^3)^2 + (5\sqrt{x^2})^3 \right) \right] : \frac{1}{x^2}$$

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

$$\left[ x^{9/2} - x^{-1/6} - x^4 - x^{-4/5} \right] \cdot x^2$$

$$x^{13/2} - x^{11/6} - x^6 - x^{6/5} = \sqrt{x^{13}} - \sqrt[6]{x^{11}} - x^6 - 5\sqrt{x^6}$$

$$4) \frac{\frac{1}{x^2} \cdot (x^3)^2 \cdot (5\sqrt{x^4})^{-2} \cdot \frac{1}{3\sqrt{x}}}{\sqrt{(x^2)^3} \cdot \frac{1}{\sqrt{x}} \cdot (4\sqrt{x^3})^{-6}} = \frac{x^{-2} \cdot x^6 \cdot x^{-8/5} \cdot x^{-1/3}}{x^3 \cdot x^{-1/4} \cdot x^{-9/2}}$$

$$x^{-2+6-8/5-1/3-(3-1/4-9/2)}$$

$$x^{-2+6-3 + -8/5-1/3+1/4+9/2} = x^1 + \frac{-96-20+15+270}{60}$$

$$= x^{1+169/60} = x^{229/60} = 60\sqrt[60]{x^{229}}$$

# Symmetrie von $f(x)$

$$f(x) = \frac{3x^3}{2x^2 - 42}$$

$$f(-x) = \frac{3 \cdot (-x)^3}{2 \cdot (-x)^2 - 42} \neq$$

$$= \frac{-3x^3}{2x^2 - 42}$$

$$\cdot (-1)$$

$$-f(-x) = -\left(\frac{-3x^3}{2x^2 - 42}\right)$$

$$= \frac{3x^3}{2x^2 - 42} = f(x)$$

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

↙ ↘

Achsensym.

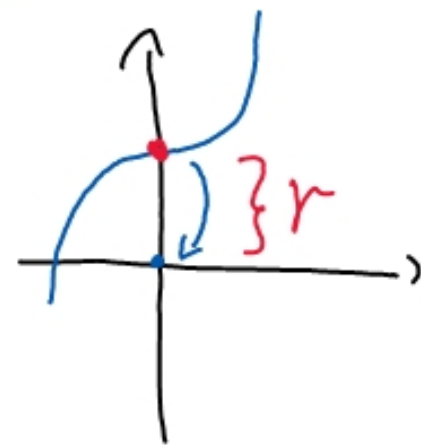
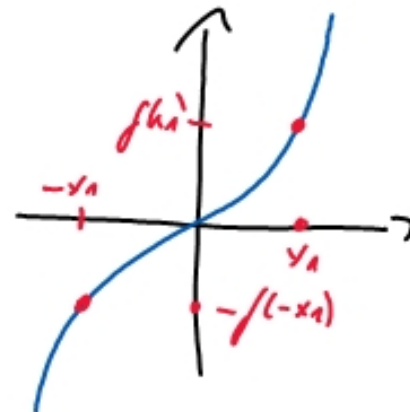
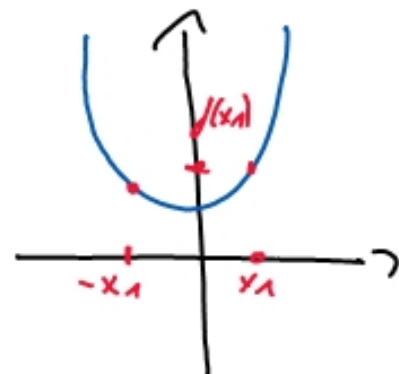
$$f(x) = -f(-x)$$

↙ ↘

Punktsym.  $\{ \}$

$\Rightarrow$  Punktsymmetrie

$$f(x) - r = -[f(-x) - r]$$



S 143

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

$$= \left( a^{\frac{24+9+2}{6}} \right)^{1/6} \cdot a^{2/3} = a^{35/36 + 2/3} = a^{59/36}$$

$\sqrt[3]{a^{59}}$   
↑

$$2) \frac{3 \cdot (2x^{-2} y^{-3})^2}{4 \cdot (3a^3 s^{-2})^3} \cdot \frac{8 \cdot (3a^4 s^{-3})^2}{9 \cdot (2x^{-1} y^{-2})^3} = \frac{3 \cdot 2^2 x^{-4} y^{-6} \cdot 2^3 3^2 a^8 s^{-6}}{2^2 3^3 a^9 s^{-6} 3^2 2^3 x^{-3} y^{-6}}$$

$$\frac{3 \cdot 2^2 \cdot 2^3 \cdot 3^2}{2^2 3^3 3^2 2^3} \cdot \frac{a^8 s^6 x^3 y^6}{x^4 y^6 s^6 a^9} = \frac{1}{9} \cdot \frac{1}{a \cdot x} = \frac{1}{9} \cdot (ax)^{-1}$$

$$3) \frac{\frac{42}{\sqrt[4]{x^{10}}}}{\frac{2n \sqrt{x^{4n-6}}}{(\sqrt[4]{x^2})^{3-2n}}} \cdot \left[ \frac{(\sqrt[4]{x})^{2n+5}}{\sqrt[3]{x^{6-4n}}} \right]^{-2} = \frac{42}{x^{\frac{10}{4}}} \cdot \frac{x^{\frac{6-4n}{4}}}{x^{\frac{4n-6}{2n}}} \cdot \frac{x^{\frac{4n+10}{4}}}{x^{\frac{12-2n}{n/2}}}$$

$$42 \cdot x^{\frac{-10 + (6-4n) - (2n-3) + (4n+10) \cdot (2n-4n)}{4}} = 42 \cdot x^{\frac{15+2n}{4}}$$

$$a) \left( \sqrt[12]{x^6} \right)^3 = x^{18/12} = x^{3/2} = 64$$

$$x = 64^{2/3} = \left( \sqrt[3]{2^6} \right)^2 = 16$$

$$b) \left( \sqrt[3]{x^7} \right)^{-4} = x^{-4/3} = \frac{16}{81}$$

$$x = \left( \frac{16}{81} \right)^{-3/4} = \left( \frac{2^4}{3^4} \right)^{3/4} = 2^{3/2} = \frac{27}{8}$$

$$c) \sqrt[5]{x^4} = \left( \frac{5}{\sqrt[5]{x^4}} \right)^2 \quad \Leftrightarrow \quad x^{2/5} = \frac{5^2}{x^{8/5}} \quad | \cdot x^{8/5}$$

$$x^2 = 5^2 \quad x = \pm 5$$

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

$$\lim_{x \rightarrow 2^+} f(x) = \pm \infty \quad \lim_{x \rightarrow \pm \infty} f(x) = \pm 0$$

$$W = y \in \mathbb{R} \setminus \{0\}$$