S 138

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

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

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

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

$(1/2x + x^3)^2 = \frac{1}{4x^2} + x^2 + x^6$ $\Big\}\ \ominus$

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

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

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

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

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

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

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

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

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

Symmetrien

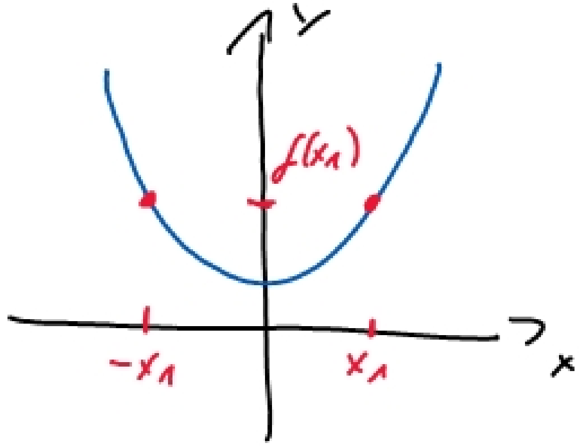
$$f(x) = f(-x) \; ?$$

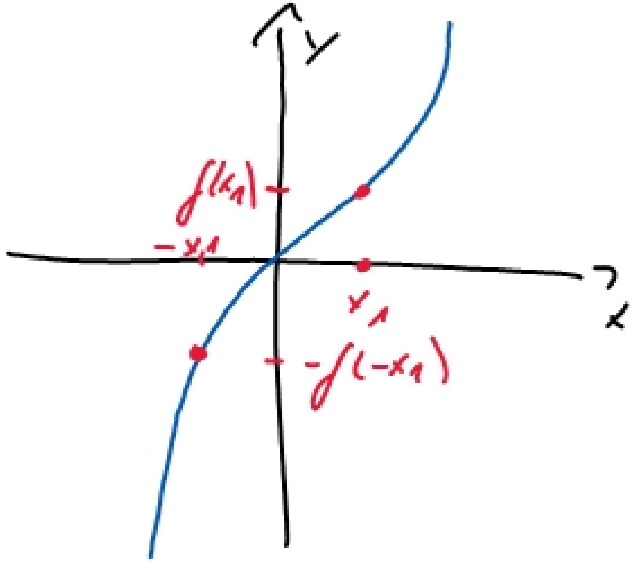
j → Achsensym.

n → $f(x) = -f(-x)$ $\quad \cdot(-1)$

j → Punktsym

n → $\{\}$





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

$$f(-x) = \frac{2\cdot(-x)^3}{4-5\cdot(-x)^2} = \frac{-2x^3}{4-5x^2} \neq f(x)$$

$$\cdot(-1)$$

$$-f(-x) = -\left[\frac{-2x^3}{4-5x^2}\right] = \frac{2x^3}{4-5x^2} = f(x) \Rightarrow \text{Punktsymmetrie}$$

S 143

$$\sqrt[36]{a^{59}}$$

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

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

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

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

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

$$42\cdot x^{\frac{-10+(6-4n)-(2n-3)+(4n+10)\cdot(24-4n)}{n}} = 42\cdot x^{\frac{15+2n}{n}}$$

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

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

b) $\left(\sqrt[3]{x}\right)^{-4} = x^{-4/3} = 16/81 \quad \left|\, (\;)^{-3/4}\right.$

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

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

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

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

$\underbrace{\lim_{x \to 2^{+/-}} f(x) = \pm\infty \qquad \lim_{x \to \pm\infty} f(x) = \pm 0}$

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