

$$1) \sqrt{x^3} \sqrt[4]{x^6} \sqrt[3]{x^{21}} = \left( x^3 (x^6)^{1/4} ((x^2)^{1/3})^{1/4} \right)^{1/2}$$

$$(x^3 \cdot x^{6/4} \cdot x^{2/2})^{1/2} = \left( x^{\frac{18+9+4}{6}} \right)^{1/2}$$

$$(x^{28/6})^{1/2} = x^{7/3} = 3\sqrt[3]{x^7}$$

$$2) \frac{(2^3 u^2 v^{-2} w)^4 \cdot (3^4 v^{-3} s^4 t^3)^2}{(3^4 v^{-3} s^{-2} t^3)^2 \cdot (2^4 u^3 v^{-4} w^{-2})^3}$$

$$\frac{2^{12} u^8 v^{-8} w^4 \cdot 3^8 v^{-6} s^8 t^6}{3^8 v^{-6} s^{-4} t^6 \cdot 2^{12} u^9 v^{-12} w^{-6}}$$

$$\frac{u^8 w^4 s^8 t^6 v^6 s^4 v^{12} w^6}{v^8 v^6 t^6 u^9} = \frac{w^{10} s^{12} v^4}{u}$$

$$10^{-1} v^4 w^{10} s^{12}$$

$$3) \frac{\sqrt[k]{a^{2k}}}{(\sqrt[k]{a})^{3k+4}} \cdot \left( \frac{\sqrt[k]{a}}{(\sqrt[k]{a^2})^{k+3}} \right)^{-2}$$

$$\frac{a^{\frac{2-k}{k}}}{a^{\frac{3k+4}{k}}} \cdot \frac{a^{-2/k}}{a^{\frac{-4k-12}{k}}} = a^{\frac{2-k - (3k+4) + (-2) - (-4k-12)}{k}}$$

$$a^{\frac{8}{k}} = \sqrt[k]{a^8}$$

$$4) \left( \frac{y^{-2} x^5 z^{15}}{x^{-3} y^4 z^7} \right)^{1/2} = \left( \frac{x^8 z^8}{y^6} \right)^{1/2} = x^4 y^{-3} z^4$$

$$5) \frac{(5a5^{-3}c^2)^3}{(2^{-3}x^2)^{-2}} \cdot \frac{(5^2xy^{-3})^{-2}}{(2^{-2}a^{-2}c^3)^2}$$

$$\frac{5^3 a^3 5^{-9} c^6 5^{-4} x^{-2} y^6}{2^6 x^{-4} 2^{-4} a^{-4} c^6}$$

$$\frac{5^3 2^4}{5^4 2^6} \cdot \frac{a^3 c^6 y^6 x^4 a^4}{5^9 x^1 c^6} = \frac{1}{20} \cdot \frac{x^4 a^7 y^6}{5^9}$$

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

$$\sqrt{\frac{3x-2-(4x-4)+5x-2}{2x}} \cdot 3 = \sqrt{\frac{12x-2}{2x}} = \sqrt{6}$$

# Symmetrie $f(x)$

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

Achsensym.

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

Punktsym.  $\{ \}$

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

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

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

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

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

$\Rightarrow$  Punktsymmetrie

$$1) \sqrt[3]{\frac{16}{x^2}} = 0,25 \quad ; \quad 2) f(x) = \sqrt[4]{x^2 - 9}$$

II) Iw; Symmetrie

$$1) \frac{16^{1/3}}{x^{2/3}} = \frac{1}{4} \Leftrightarrow \frac{2^{4/3}}{x^{2/3}} = 2^{-2} \quad | \cdot x^{2/3} : 2^{-2}$$

$$\frac{2^{4/3}}{2^{-2}} = 2^{4/3} \cdot 2^2 = 2^{10/3} = x^{2/3} \quad | \uparrow^{3/2} \quad x = 2^5 = 32$$

$$2) f(x) = \sqrt[4]{x^2 - 9} \quad f(-x) = \sqrt[4]{(-x)^2 - 9} = \sqrt[4]{x^2 - 9}$$

$$\text{II): } x^2 - 9 = 0 \Leftrightarrow x^2 = 9 \Rightarrow x = \pm \sqrt{9} = \pm 3$$

$$\text{III) } = \{x \in \mathbb{R} \mid x \geq 3 \vee x \leq -3\} ; \text{ Iw: } \mathbb{R}_0^+$$

