

$$\begin{aligned}
 1) \quad \sqrt{x^3 \sqrt[4]{x^6} \sqrt[3]{x^2}} &= \left[ x^3 (x^6)^{1/4} \left( (x^2)^{1/3} \right)^{1/3} \right]^{1/2} \\
 &= \left( x^3 \cdot x^{6/4} \cdot x^{2/9} \right)^{1/2} \\
 &= \left( x^{3 + 3/2 + 1/6} \right)^{1/2} = \left( x^{\frac{18+9+1}{6}} \right)^{1/2} \\
 &= \left( x^{28/6} \right)^{1/2} = x^{7/3} = 3\sqrt{x^7}
 \end{aligned}$$

$$\begin{aligned}
 2) \quad \frac{(2^3 u^2 v^{-2} w)^4}{(3^4 r^{-3} s^{-2} t^3)^2} \cdot \frac{(3^4 r^{-3} s^4 t^3)^2}{(2^4 u^3 v^{-4} w^{-2})^3} \\
 \frac{2^{12} u^8 v^{-8} w^4 \quad 3^8 r^{-6} s^8 t^6}{3^8 r^{-6} s^{-4} t^6 \quad 2^{12} u^9 v^{-12} w^{-6}} \\
 \frac{u^8 w^4 s^8 t^6 r^6 s^4 v^{12} w^6}{v^8 r^6 t^6 u^9} = \frac{w^{10} s^{12} v^4}{u}
 \end{aligned}$$

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

$$\frac{a^{\frac{2-k}{k}}}{a^{\frac{3k+4}{k}}} \cdot \frac{a^{-\frac{2}{k}}}{a^{\frac{-4k-12}{k}}}$$

$$a^{\frac{2-k - (3k+4) + -2 - (-4k-12)}{k}} = a^{\frac{8}{k}} = k\sqrt[8]{a}$$

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

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

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

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

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

$$\left( \frac{h^{\frac{3x-2}{2x}}}{h^{\frac{4x-4}{2x}}} \cdot h^{\frac{5x-2}{2x}} \right)^3 = h^{\frac{(3x-2)-(4x-4) + (5x-2)}{2x}} \cdot 3$$

$$= h^{\frac{12x}{2x}} = h^6$$

# Symmetrie

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

$\int$   
↙  
Achsensym.

$\searrow$   
 $\mathcal{N}$   
↘  
 $\cdot (-1)$

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

$\int$   
↙  
Punktsym.

$\searrow$   
 $\mathcal{N}$   
↘  
 $\{ \}$

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

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

$$= \frac{-x}{x^2 - 4}$$

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

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

$\Rightarrow$  Punktsym.

$$c) \sqrt[5]{\sqrt{x^4}} = \left( \frac{5}{\sqrt[5]{x^4}} \right)^2 \Leftrightarrow x^{4/10} = \frac{5^2}{x^{8/5}} \quad | \cdot x^{8/5}$$

$$x^{2/5} \cdot x^{8/5} = x^{2/5 + 8/5} = x^2 = 5^2$$

$$x = 5$$