

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

$$= x^{3/2} \cdot x^{6/8} \cdot x^{2/24}$$

$$= x^{3/2} \cdot x^{3/4} \cdot x^{1/12}$$

$$= x^{\frac{18 + 9 + 1}{12}} = x^{28/12} = x^{7/3}$$

$$= \sqrt[3]{x^7}$$

$$\begin{aligned}
 & 2) \quad \frac{(2^3 u^2 v^{-2} w)^4}{(3^4 r^{-3} s^{-2} t^3)^2} \cdot \frac{(3^4 r^{-3} s^4 t^3)^2}{(2^4 u^3 v^{-4} w^{-2})^3} \\
 & \frac{2^{12} u^8 v^{-8} w^4 \cdot 3^8 r^{-6} s^8 t^6}{3^8 r^{-6} s^{-4} t^6 \cdot 2^{12} u^9 v^{-12} w^{-6}} \\
 & \frac{2^{12} 3^8}{3^8 2^{12}} \cdot \frac{u^8 w^4 s^8 t^6 v^6 s^4 v^{12} w^6}{v^8 r^6 t^6 u^9} \\
 & \underbrace{\quad} \cdot \frac{w^{10} s^{12} v^4}{u} = u^{-1} v^4 w^{10} s^{12}
 \end{aligned}$$

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

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

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

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

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

$$= a^{2/3} a^{1/4} a^{1/18} a^{2/3}$$

$$= a^{\frac{24 + 9 + 2 + 24}{36}}$$

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