

Solutions

$$\begin{aligned}
 \textcircled{1} \quad \frac{(2w^2k^4)^3}{(-wk^5)^2(w^4k^2)} &= \frac{2^3(w^2)^3(k^4)^3}{(-w)^2(k^5)^2 \cdot w^4 k^2} \\
 &= \frac{8w^6k^{12}}{w^2k^{10} \cdot w^4k^2} \\
 &= \frac{8w^6k^{12}}{w^{2+4}k^{10+2}} \\
 &= \frac{8w^6k^{12}}{w^6k^{12}} \\
 &= 8w^{6-6}k^{12-12} \\
 &= 8w^0k^0 \\
 &= 8
 \end{aligned}$$

$$2.) \quad [(2ef^3g^2)^2 \cdot (3efg^3)] \div (9e^6f^2g)$$

$$\begin{aligned}
 &\frac{2^2 e^2 (f^3)^2 (g^2)^2 \cdot 3efg^3}{9e^6 f^2 g} \\
 &\rightarrow \frac{4e^2 f^6 g^4 \cdot 3efg^3}{9e^6 f^2 g} \\
 &\rightarrow \frac{12e^{2+1} f^{6+1} g^{4+3}}{9e^6 f^2 g} \\
 &\rightarrow \frac{12e^3 f^7 g^7}{9e^6 f^2 g} = \frac{4e^{3-6} f^{7-2} g^{7-1}}{3} = \frac{4e^{-3} f^5 g^6}{3} = \frac{4f^5 g^6}{3e^3}
 \end{aligned}$$

$$\textcircled{3} \frac{(3a^2b^{-5})^{-2}(2a^2b)^4}{(-6a^{-4})^{-2}(3a^{-6}b^3)^2} = \frac{3^{-2}(a^2)^{-2}(b^{-5})^{-2} 2^4(a^2)^4 b^4}{(-6)^{-2}(a^{-4})^{-2} (3)^2(a^{-6})^2 (b^3)^2}$$

$$= \frac{3^{-2} a^{-4} b^{10} \cdot 16 a^8 b^4}{(-6)^{-2} a^8 \cdot 9 a^{-12} b^6}$$

$$= \frac{(-6)^2 a^{-4+8} b^{10+4} \cdot 16}{3^2 a^{8-12} b^6 \cdot 9}$$

$$= \frac{36(16) a^4 b^{14}}{9(9) a^{-4} b^6}$$

$$= \frac{64 a^{4-(-4)} b^{14-6}}{9}$$

$$= \frac{64 a^8 b^8}{9}$$

$$\textcircled{4} \left(\frac{8x^{-9}}{y^{-6}} \right)^{-2/3} = \frac{8^{-2/3} x^{18/3}}{y^{12/3}}$$

$$= \frac{x^6}{8^{2/3} y^4}$$

$$= \frac{x^6}{(\sqrt[3]{8})^2 y^4} = \frac{x^6}{2^2 y^4} = \frac{x^6}{4y^4}$$

$$\textcircled{5} \sqrt{56 w^3 y^6}$$

\swarrow
 $2 \cdot 28$
 \swarrow
 $2 \cdot 14$
 \swarrow
 $2 \cdot 7$

\searrow
 $w^2 \cdot w$

\searrow
 $y^2 \cdot y^2 \cdot y^2$

$$\sqrt{2^2} \cdot \sqrt{2 \cdot 7} \cdot \sqrt{w^2} \cdot \sqrt{w} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y^2}$$

$$2 \cdot \sqrt{14} \cdot w \cdot \sqrt{w} \cdot y \cdot y \cdot y$$

$$2w y^3 \sqrt{14w}$$

$$2 |wy^3| \sqrt{14w}$$

$$\textcircled{6} \sqrt[3]{4m^2} \cdot \sqrt[3]{18m^3n^{10}}$$

$$\sqrt[3]{4 \cdot 18 \cdot m^2 \cdot m^3 \cdot n^{10}}$$

$$\sqrt[3]{72 m^{2+3} \cdot n^{10}}$$

$$\sqrt[3]{72 m^5 n^{10}}$$

\swarrow
 $2 \cdot 36$
 \swarrow
 $2 \cdot 18$
 \swarrow
 $2 \cdot 9$
 \swarrow
 $3 \cdot 3$

\searrow
 $m^3 \cdot m^2$

\searrow
 $n^3 \cdot n^3 \cdot n^3 \cdot n$

$$\sqrt[3]{2^3} \cdot \sqrt[3]{3^2} \cdot \sqrt[3]{m^3} \cdot \sqrt[3]{m^2} \cdot \sqrt[3]{n^3} \cdot \sqrt[3]{n^3} \cdot \sqrt[3]{n^3} \cdot \sqrt[3]{n}$$

$$2 \cdot \sqrt[3]{9} \cdot m \cdot \sqrt[3]{m^2} \cdot n \cdot n \cdot n \cdot \sqrt[3]{n}$$

$$2mn^3 \sqrt[3]{9m^2n}$$

$$\begin{aligned}
 7.) \quad \left(x^{\frac{1}{4}} y^{-\frac{3}{8}}\right)^{16} &= \left(x^{\frac{1}{4}}\right)^{16} \cdot \left(y^{-\frac{3}{8}}\right)^{16} = x^4 \cdot y^{-\frac{48}{8}} = x^4 y^{-6} \\
 &= \frac{x^4}{y^6}
 \end{aligned}$$

$$\begin{aligned}
 8.) \quad \left(32 x^{20} y^{-10}\right)^{-\frac{3}{5}} &= 32^{-\frac{3}{5}} \left(x^{20}\right)^{-\frac{3}{5}} \left(y^{-10}\right)^{-\frac{3}{5}} \\
 &= \frac{x^{-\frac{60}{5}} y^{\frac{30}{5}}}{32^{\frac{3}{5}}} \\
 &= \frac{x^{-12} y^6}{\left(\sqrt[5]{32}\right)^3} = \frac{y^6}{2^3 \cdot x^{12}} = \frac{y^6}{8x^{12}}
 \end{aligned}$$

$$\begin{aligned}
 9.) \quad -\sqrt{7x} + 3\sqrt{28x} &= -\sqrt{7x} + 3 \cdot \sqrt{4 \cdot 7} \cdot \sqrt{x} \\
 &= -\sqrt{7x} + 3 \cdot 2 \cdot \sqrt{7x} \\
 &= -\sqrt{7x} + 6\sqrt{7x} \\
 &= 5\sqrt{7x}
 \end{aligned}$$

$$\begin{aligned}
 10.) \quad &\overbrace{(6-\sqrt{7})(1-\sqrt{7})} \\
 &\underbrace{\hspace{10em}} \\
 &6 - 6\sqrt{7} - \sqrt{7} + \sqrt{49} \\
 &6 - 7\sqrt{7} + 7 \\
 &13 - 7\sqrt{7}
 \end{aligned}$$

$$\textcircled{11} \quad \frac{\sqrt[4]{y^3}}{\sqrt[5]{y^4}} = \frac{y^{3/4}}{y^{4/5}} = y^{3/4 - 4/5} = y^{\frac{15}{20} - \frac{16}{20}} = y^{-1/20} = \frac{1}{y^{1/20}}$$

$$\textcircled{12} \quad \left(\frac{5t^0 - 3}{9s^2} \right)^{-1} = \left(\frac{5(1) - 3}{9s^2} \right)^{-1} \\ = \left(\frac{2}{9s^2} \right)^{-1} = \frac{2^{-1}}{9^{-1}(s^2)^{-1}} = \frac{9}{2s^{-2}} = \frac{9s^2}{2}$$

$$\textcircled{13} \quad \frac{2^{-5} (a^{-3} b^2)^{-1}}{(2^{-4})^3 a^4 (b k^{-1})^{-2}} = \frac{2^{-5} (a^{-3})^{-1} (b^2)^{-1}}{2^{-12} a^4 b^{-2} (k^{-1})^{-2}} \\ = \frac{2^{-5} a^3 b^{-2}}{2^{-12} a^4 b^{-2} k^2} \\ = \frac{2^{-5-12} a^{3-4} b^{-2-2}}{k^2} \\ = \frac{2^7 a^{-1} b^0}{k^2} = \frac{128}{ak^2}$$

$$\begin{aligned}
 (14) \quad \frac{\sqrt[3]{x^2 y^5}}{\sqrt[3]{x \cdot y^4}} &= \sqrt[3]{\frac{x^2 y^5}{x y^4}} = \sqrt[3]{x^{2-1} y^{5-4}} \\
 &= \sqrt[3]{x y}
 \end{aligned}$$

$$\begin{aligned}
 (15) \quad \sqrt{2x^5} \cdot \sqrt{12x^4} &= \sqrt{2x^5 \cdot 12x^4} \\
 &= \sqrt{24x^{5+4}} \\
 &= \sqrt{24x^9} \\
 &\quad \underbrace{4 \cdot 6}_{\substack{\sqrt{4} \cdot \sqrt{6}}} \quad \underbrace{x^2 \cdot x^7}_{\substack{\sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x}}} \\
 &= \sqrt{4} \cdot \sqrt{6} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x} \\
 &= 2 \cdot \sqrt{6} \cdot x \cdot x \cdot x \cdot x \cdot \sqrt{x} \\
 &= 2x^4 \sqrt{6x}
 \end{aligned}$$