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6.4 – Rational Exponents

Simplify each expression.

1. $125^{\frac{1}{3}}$ $\sqrt[3]{125} = 5$

2. $64^{-\frac{1}{2}}$ $\frac{1}{\sqrt{64}} = \frac{1}{8}$

3. $32^{\frac{3}{5}}$ $\left(\sqrt[5]{32}\right)^3 = 2^3 = 8$

Write each expression in radical form.

4. $x^{\frac{4}{3}}$ $\sqrt[3]{x^4}$

5. $(2y)^{\frac{1}{3}}$ $\sqrt[3]{(2y)}$

6. $a^{1.5}$ $a^{3/2}$ $\sqrt{a^3}$

7. $b^{\frac{1}{5}}$ $\sqrt[5]{b}$

8. $z^{\frac{2}{3}}$ $\sqrt[3]{z^2}$

9. $(ab)^{\frac{1}{4}}$ $\sqrt[4]{ab}$

Write each expression in exponential form.

10. $\sqrt{x^3}$ $x^{3/2}$

11. $\sqrt[3]{m}$ $m^{1/3}$

12. $\sqrt{5y}$ $(5y)^{1/2}$

13. $\sqrt[3]{2y^2}$ $(2y^2)^{1/3}$

14. $(\sqrt[4]{b})^3$ $b^{3/4}$

15. $\sqrt{-6}$ $(-6)^{1/2}$

Write each expression in simplest form. Assume that all variables are positive.

16. $\left(\frac{27x^6}{64y^4}\right)^{\frac{1}{3}}$ $\frac{\sqrt[3]{27}\,x^2}{\sqrt{64}\,y^{4/3}} = \frac{3x^2}{4y^{4/3}}$

17. $\frac{x^{\frac{1}{2}}y^{\frac{2}{3}}}{x^{\frac{1}{3}}y^{\frac{1}{2}}}$ $x^{1/2-1/3}$ $x^{3/6-2/6} = x^{1/6}$ $y^{2/3}\cdot y^{1/2} = y^{1/6}$ $x^{1/6}y^{1/6}$

18. $y^{\frac{5}{8}} \div y^{\frac{1}{2}}$ $\frac{5}{8}-\frac{1}{2} = 1/8$ $\frac{y^{5/8}}{y^{1/2}} = y^{1/8}$

19. $x^{\frac{1}{4}}\cdot x^{\frac{1}{6}}\cdot x^{\frac{1}{3}}$ $\frac{1}{4}+\frac{1}{6}+\frac{1}{3}$ $\frac{6}{24}+\frac{4}{24}+\frac{8}{24}$ $18/24$ $x^{3/4}$

20. $\left(\frac{x^{-\frac{1}{3}}y}{x^{\frac{2}{3}}y^{-\frac{1}{2}}}\right)^2$ $1-\left(-\frac{1}{2}\right)$ $-\frac{1}{3}-\frac{2}{3} = -1$ $3/2$ $\left(x^{-1}y^{3/2}\right)^2$ $\left(\frac{y^{3/2}}{x}\right)^2$ $\frac{y^3}{x^2}$

21. $\left(\frac{12x^8}{75y^{10}}\right)^{\frac{1}{2}}$ $\frac{\sqrt{12}\,x^4}{\sqrt{75}\,y^5}$ $\frac{2\sqrt{3}\,x^4}{5\sqrt{3}\,y^5}$ $\frac{2x^4}{5y^5}$