

Exponents

ANS Key

A-20, 21

In Exercises 5-12, evaluate each expression.

5. (a) $3^2 \cdot 3 = 27$ (b) $3 \cdot 3^3 = 81$
 6. (a) $\frac{5^5}{5^2} = 5^3 = 125$ (b) $\frac{3^2}{3^4} = 3^{-2} = \frac{1}{9}$
 7. (a) $(3^3)^0 = 1$ (b) $-3^2 = -9$
 8. (a) $(2^3 \cdot 3^2)^2 = 5184$ (b) $(-\frac{3}{5})^3 (\frac{5}{3})^2 = -\frac{27}{125} \cdot \frac{25}{9} = -\frac{3}{5}$
 9. (a) $\frac{3 \cdot 4^{-4}}{3^{-4} \cdot 4^{-1}} = \frac{243}{64}$ (b) $32(-2)^{-5} = -\frac{1}{2}$
 10. (a) $\frac{4 \cdot 3^{-2}}{2^{-2} \cdot 3^{-1}} = \frac{16}{9}$ (b) $(-2)^0 = 1$
 11. (a) $2^{-1} + 3^{-1} = \frac{5}{6}$ (b) $(2^{-1})^{-2} = 4$
 12. (a) $\frac{3^{-1} + 2^{-2}}{\frac{1}{3} + \frac{1}{4}} = \frac{7}{12}$ (b) $(3^{-2})^2 \cdot 3^{-4} = \frac{1}{81}$

In Exercises 13-16, use a calculator to evaluate the expression. (If necessary, round your answer to three decimal places.)

13. $(-4)^3(5^2)^{-1}$ 14. $(8^{-4})(10^3)$
 15. $\frac{3^6}{7^3}$ 16. $\frac{4^3}{3^{-4}}$

22. $-3x^4$ $x = -2$
 23. $4x^2$ $x = -\frac{1}{2}$
 24. $5(-x)^3$ $x = -\frac{1}{3}$

In Exercises 25-30, simplify each expression.

25. (a) $(-5z)^3 = -125z^3$ (b) $5x^4(x^2) = 5x^6$
 26. (a) $(3x)^2 = 9x^2$ (b) $(4x^3)^0 = 1$
 27. (a) $6y^2(2y^0)^2 = 24y^2$ (b) $\frac{3x^5}{x^3} = 3x^2$
 28. (a) $(-z)^3(3z^4) = -3z^7$ (b) $\frac{25y^8}{10y^4} = \frac{5}{2}y^4$
 29. (a) $\frac{7x^2}{x^3} = \frac{7}{x}$ (b) $\frac{12(x+y)^3}{9(x+y)} = \frac{4}{3}(x+y)^2$
 30. (a) $\frac{r^4}{r^6} = \frac{1}{r^2}$ (b) $(\frac{4}{y})^3 (\frac{3}{y})^4 = \frac{5184}{y^7}$

In Exercises 31-36, rewrite each expression with positive exponents and simplify.

31. (a) $(x+5)^0, x \neq -5$ (b) $(2x^2)^{-2} = \frac{1}{4x^4}$
 32. (a) $(2x^5)^0, x \neq 0$ (b) $(z+2)^{-3}(z+2)^{-1} = \frac{1}{(z+2)^4}$
 33. (a) $(-2x^2)^3(4x^3)^{-1} = -2x^3$ (b) $(\frac{x}{10})^{-1} = 10x$
 34. (a) $(4y^{-2})(8y^4) = 32y^2$ (b) $(\frac{x^{-3}y^4}{5})^{-3} = \frac{125x^9}{y^{12}}$
 35. (a) $3^n \cdot 3^{2n} = 3^{3n}$ (b) $(\frac{a^{-2}}{b^{-2}})(\frac{b}{a})^3 = \frac{b^5}{a^5}$
 36. (a) $\frac{x^2 \cdot x^n}{x^3 \cdot x^n} = \frac{1}{x}$ (b) $(\frac{a^{-3}}{b^{-3}})(\frac{a}{b})^3 = 1$

In Exercises 51-56, evaluate each expression without using a calculator.

51. (a) $\sqrt{9} = 3$ (b) $\sqrt[3]{\frac{27}{8}} = \frac{3}{2}$
 52. (a) $27^{1/3} = 3$ (b) $36^{3/2} = 216$
 53. (a) $32^{-3/5} = \frac{1}{8}$ (b) $(\frac{16}{81})^{-3/4} = \frac{27}{8}$

54. (a) $100^{-3/2} = \frac{1}{1000}$ (b) $(\frac{8}{27})^{-1/2} = \frac{3}{2}$
 55. (a) $(-\frac{1}{64})^{-1/3} = -4$ (b) $(\frac{1}{\sqrt{32}})^{-2/5} = 2$
 56. (a) $(-\frac{125}{27})^{-1/3} = -\frac{3}{5}$ (b) $(-\frac{1}{125})^{-4/3} = -625$

$(2+n) - (3+n) = -1$

$\frac{x^{-9}y^{-12}}{125} = \frac{1}{125x^9y^{12}}$

$\frac{a^{-3}}{b^{-3}} = \frac{a^3}{b^3}$

$\frac{64}{y^2} \cdot \frac{81}{y^4} = \frac{5184}{y^6}$