In Exercises 9–16, evaluate each expression.

9. (a) $3^2 \cdot 3$ (b) $3 \cdot 3^3$

10. (a) $\dfrac{5^5}{5^2}$ (b) $\dfrac{3^2}{3^4}$

11. (a) $(3^3)^2$ (b) -3^2

12. (a) $(2^3 \cdot 3^2)^2$ (b) $\left(-\frac{3}{5}\right)^3\left(\frac{5}{3}\right)^2$

13. (a) $\dfrac{3 \cdot 4^{-4}}{3^{-4} \cdot 4^{-1}}$ (b) $32(-2)^{-5}$

14. (a) $\dfrac{4 \cdot 3^{-2}}{2^{-2} \cdot 3^{-1}}$ (b) $(-2)^0$

15. (a) $2^{-1} + 3^{-1}$ (b) $(2^{-1})^{-2}$

16. (a) $3^{-1} + 2^{-2}$ (b) $(3^{-2})^2$

In Exercises 29–34, simplify each expression.

29. (a) $(-5z)^3$ (b) $5x^4(x^2)$

30. (a) $(3x)^2$ (b) $(4x^3)^2$

31. (a) $6y^2(2y^4)^2$ (b) $\dfrac{3x^5}{x^3}$

32. (a) $(-z)^3(3z^4)$ (b) $\dfrac{25y^8}{10y^4}$

33. (a) $\dfrac{7x^2}{x^3}$ (b) $\dfrac{12(x+y)^3}{9(x+y)}$

34. (a) $\dfrac{r^4}{r^6}$ (b) $\left(\frac{4}{y}\right)^3\left(\frac{3}{y}\right)^4$

In Exercises 35–40, rewrite each expression with positive exponents and simplify.

35. (a) $(x+5)^0, \quad x \neq -5$ (b) $(2x^2)^{-2}$

36. (a) $(2x^5)^0, \quad x \neq 0$ (b) $(z+2)^{-3}(z+2)^{-1}$

37. (a) $(-2x^2)^3(4x^3)^{-1}$ (b) $\left(\dfrac{x}{10}\right)^{-1}$

38. (a) $(4y^{-2})(8y^4)$ (b) $\left(\dfrac{x^{-3}y^4}{5}\right)^{-3}$

39. (a) $3^n \cdot 3^{2n}$ (b) $\left(\dfrac{a^{-2}}{b^{-2}}\right)\left(\dfrac{b}{a}\right)^3$

40. (a) $\dfrac{x^2 \cdot x^n}{x^3 \cdot x^n}$ (b) $\left(\dfrac{a^{-3}}{b^{-3}}\right)\left(\dfrac{a}{b}\right)^3$

In Exercises 67–74, evaluate each expression without using a calculator.

67. (a) $\sqrt{9}$ (b) $\sqrt[3]{8}$

68. (a) $\sqrt{49}$ (b) $\sqrt[3]{\frac{27}{8}}$

69. (a) $\left(\sqrt[3]{-125}\right)^3$ (b) $27^{1/3}$

70. (a) $\sqrt[4]{562^4}$ (b) $36^{3/2}$

71. (a) $32^{-3/5}$ (b) $\left(\frac{16}{81}\right)^{-3/4}$

72. (a) $100^{-3/2}$ (b) $\left(\frac{9}{4}\right)^{-1/2}$

73. (a) $\left(-\dfrac{1}{64}\right)^{-1/3}$ (b) $\left(\dfrac{1}{\sqrt{32}}\right)^{-2/5}$

74. (a) $\left(-\dfrac{125}{27}\right)^{-1/3}$ (b) $-\left(\dfrac{1}{125}\right)^{-4/3}$

In Exercises 1–24, find all solutions of the equation. Check your solutions in the original equation.

1. $4x^4 - 18x^2 = 0$

2. $20x^3 - 125x = 0$

3. $x^4 - 81 = 0$

4. $x^6 - 64 = 0$

5. $x^3 + 216 = 0$

6. $27x^3 - 512 = 0$

7. $5x^3 + 30x^2 + 45x = 0$

8. $9x^4 - 24x^3 + 16x^2 = 0$

9. $x^3 - 3x^2 - x + 3 = 0$

10. $x^3 + 2x^2 + 3x + 6 = 0$

11. $x^4 - x^3 + x - 1 = 0$

12. $x^4 + 2x^3 - 8x - 16 = 0$

13. $x^4 - 4x^2 + 3 = 0$

14. $x^4 + 5x^2 - 36 = 0$

15. $4x^4 - 65x^2 + 16 = 0$

16. $36t^4 + 29t^2 - 7 = 0$

17. $x^6 + 7x^3 - 8 = 0$

18. $x^6 + 3x^3 + 2 = 0$

In Exercises 29–52, find all solutions of the equation. Check your solutions in the original equation.

29. $\sqrt{2x} - 10 = 0$

30. $4\sqrt{x} - 3 = 0$

31. $\sqrt{x - 10} - 4 = 0$

32. $\sqrt{5 - x} - 3 = 0$

33. $\sqrt[3]{2x + 5} + 3 = 0$

34. $\sqrt[3]{3x + 1} - 5 = 0$

35. $-\sqrt{26 - 11x} + 4 = x$

36. $x + \sqrt{31 - 9x} = 5$

37. $\sqrt{x + 1} = \sqrt{3x + 1}$

38. $\sqrt{x + 5} = \sqrt{x - 5}$

39. $\sqrt{x} - \sqrt{x - 5} = 1$

40. $\sqrt{x} + \sqrt{x - 20} = 10$

41. $\sqrt{x + 5} + \sqrt{x - 5} = 10$

42. $2\sqrt{x + 1} - \sqrt{2x + 3} = 1$

43. $\sqrt{x + 2} - \sqrt{2x - 3} = -1$

44. $4\sqrt{x - 3} - \sqrt{6x - 17} = 3$

45. $(x - 5)^{3/2} = 8$

46. $(x + 3)^{3/2} = 8$

47. $(x + 3)^{2/3} = 8$

48. $(x + 2)^{2/3} = 9$

49. $(x^2 - 5)^{3/2} = 27$