

## APPENDIX A.3 EXERCISES

In Exercises 1–8, rewrite as a single fraction.

1.  $\frac{5}{9} + \frac{10}{9}$

2.  $\frac{17}{32} - \frac{9}{32}$

3.  $\frac{20}{21} \cdot \frac{9}{22}$

4.  $\frac{33}{25} \cdot \frac{20}{77}$

5.  $\frac{2}{3} \div \frac{4}{5}$

6.  $\frac{9}{4} \div \frac{15}{10}$

7.  $\frac{1}{14} + \frac{4}{15} - \frac{5}{21}$

8.  $\frac{1}{6} + \frac{6}{35} - \frac{4}{15}$

In Exercises 9–18, find the domain of the algebraic expression.

9.  $5x^2 - 3x - 7$

10.  $2x - 5$

11.  $\sqrt{x-4}$

12.  $\frac{2}{\sqrt{x+3}}$

13.  $\frac{2x+1}{x^2+3x}$

14.  $\frac{x^2-2}{x^2-4}$

15.  $\frac{x}{x-1}, x \neq 2$

16.  $\frac{3x-1}{x-2}, x \neq 0$

17.  $x^2 + x^{-1}$

18.  $x(x+1)^{-2}$

In Exercises 19–26, find the missing numerator or denominator so that the two rational expressions are equal.

19.  $\frac{2}{3x} = \frac{?}{12x^3}$

20.  $\frac{5}{2y} = \frac{15y}{?}$

21.  $\frac{x-4}{x} = \frac{x^2-4x}{?}$

22.  $\frac{x}{x+2} = \frac{?}{x^2-4}$

23.  $\frac{x+3}{x-2} = \frac{?}{x^2+2x-8}$

24.  $\frac{x-4}{x+5} = \frac{x^2-x-12}{?}$

25.  $\frac{x^2-3x}{?} = \frac{x-3}{x^2+2x}$

26.  $\frac{?}{x^2-9} = \frac{x^2+x-6}{x-3}$

In Exercises 27–32, consider the original fraction and its reduced form from the specified example. Explain why the given restriction is needed on the reduced form.

27. Example 3a,  $x \neq 2, x \neq -7$

28. Example 3b,  $x \neq -1, x \neq 2$

29. Example 4, none

30. Example 5,  $x \neq 0$

31. Example 6,  $x \neq 3$

32. Example 7,  $a \neq b$

In Exercises 33–44, write the expression in reduced form.

33.  $\frac{18x^3}{15x}$

34.  $\frac{75y^2}{9y^4}$

35.  $\frac{x^3}{x^2-2x}$

36.  $\frac{2y^2+6y}{4y+12}$

37.  $\frac{z^2-3z}{9-z^2}$

38.  $\frac{x^2+6x+9}{x^2-x-12}$

39.  $\frac{y^2-y-30}{y^2-3y-18}$

40.  $\frac{y^3+4y^2-21y}{y^2-49}$

41.  $\frac{8z^3-1}{2z^2+5z-3}$

42.  $\frac{2z^3+6z^2+18z}{z^3-27}$

43.  $\frac{x^3+2x^2-3x-6}{x^3+2x^2}$

44.  $\frac{y^2+3y}{y^3+3y^2-5y-15}$

In Exercises 45–62, simplify.

45.  $\frac{3}{x-1} \cdot \frac{x^2-1}{9}$

46.  $\frac{x+3}{7} \cdot \frac{14}{2x+6}$

47.  $\frac{x+3}{x-1} \cdot \frac{1-x}{x^2-9}$

48.  $\frac{18x^2-3x}{3xy} \cdot \frac{12y^2}{6x-1}$

49.  $\frac{x^3-1}{2x^2} \cdot \frac{4x}{x^2+x+1}$

50.  $\frac{y^3+2y^2+4y}{y^3+2y^2} \cdot \frac{y^2-4}{y^3-8}$

51.  $\frac{2y^2+9y-5}{y^2-25} \cdot \frac{y-5}{2y^2-y}$

52.  $\frac{y^2+8y+16}{3y^2-y-2} \cdot \frac{3y^2+2y}{y+4}$

53.  $\frac{1}{2x} \div \frac{1}{4}$

54.  $\frac{4x}{y} + \frac{8y}{x}$

55.  $\frac{x^2-3x}{14y} + \frac{2xy}{3y^2}$

56.  $\frac{7x-7y}{4y} \div \frac{14x-14y}{3y}$

57.  $\frac{2x^2y}{(x-3)^2}$

58.  $\frac{2xy}{y^2-x^2}$

59.  $\frac{8xy}{x-3}$

60.  $\frac{3}{x-2} + \frac{x+1}{x-2}$

61.  $\frac{2x+1}{x+5} - \frac{3}{x+5}$

62.  $\frac{3}{x^2+3x} - \frac{1}{x} - \frac{6}{x^2-9}$

63.  $\frac{3}{x^2+3x} - \frac{1}{x} - \frac{6}{x^2-9}$

64.  $\frac{1}{x^2} - \frac{1}{y^2}$

65.  $\frac{5}{x^2+x-6} - \frac{2}{x-2} + \frac{4}{x^2-4}$

66.  $2 - \frac{13}{x+5}$

In Exercises 63–70, simplify the compound fraction.

67.  $\frac{\frac{x}{y^2} - \frac{y}{x^2}}{\frac{1}{y^2} - \frac{1}{x^2}}$

68.  $\frac{2 - \frac{13}{x+5}}{2 + \frac{3}{x-3}}$

69.  $\frac{2x + \frac{13x-3}{x-4}}{2x + \frac{x+3}{x-4}}$

70.  $\frac{\frac{x+h}{x+h+2} - \frac{x}{x+2}}{h}$

71.  $\frac{\frac{1}{a} - \frac{1}{b}}{\frac{1}{a} - \frac{1}{b}}$

72.  $\frac{\frac{1}{a} + \frac{1}{b}}{\frac{b}{a} - \frac{a}{b}}$

73.  $\frac{1}{(x+h)^2} - \frac{1}{x^2}$

74.  $x^{-1} + y^{-1}$

75.  $\frac{b}{a} - \frac{a}{b}$

76.  $\frac{1}{a} + \frac{1}{b}$

77.  $\frac{1}{a} - \frac{1}{b}$

78.  $\frac{1}{a} - \frac{1}{b}$

79.  $\frac{1}{a} + \frac{1}{b}$

80.  $\frac{1}{a} + \frac{1}{b}$

81.  $\frac{1}{a} - \frac{1}{b}$

82.  $\frac{1}{a} - \frac{1}{b}$

In Exercises 71–74, write with positive exponents and simplify.

71.  $\left(\frac{1}{x} + \frac{1}{y}\right)(x+y)^{-1}$

72.  $\frac{(x+y)^{-1}}{(x-y)^{-1}}$

73.  $x^{-1} + y^{-1}$

74.  $(x^{-1} + y^{-1})^{-1}$