

Mini-Lecture 6.1

Rational Functions and Multiplying and Dividing Rational Expressions

Learning Objectives:

1. Find the domain of a rational function.
2. Simplify rational expressions.
3. Multiply rational expressions.
4. Divide rational expressions.
5. Use rational functions in applications.
6. Key vocabulary: *undefined, domain, simplify, reciprocal.*

Examples:

1. Find the domain of each rational expression.

a) $f(x) = \frac{2+3x}{4}$

b) $g(x) = -\frac{6x+x^2}{5x}$

c) $h(x) = \frac{2-5x}{-7+x}$

d) $p(x) = \frac{-9}{7x+5}$

e) $f(x) = \frac{x}{2x^2+x-3}$

2. Simplify each rational expression.

a) $\frac{2x^2-6x}{2x}$

b) $\frac{x^2-81}{9+x}$

c) $\frac{x^2-10x+25}{x-5}$

d) $\frac{x-8}{8-x}$

e) $\frac{y^2+5y+6}{y^2+10y+21}$

f) $\frac{y^3-64}{4y-16}$

3. Multiply and simplify.

a) $\frac{3x-3}{x} \square \frac{8x^2}{5x-5}$

b) $\frac{24xy^2}{x^2-49} \square \frac{3x-21}{8x^2y^2}$

c) $\frac{x^2+7x+10}{x^2+8x+15} \square \frac{x^2+3x}{x^2-7x-18}$

4. Divide and simplify.

a) $\frac{4x^2}{5} \div \frac{x^3}{40}$

b) $\frac{x^2+5x-6}{x^2+9x+18} \div \frac{x^2-1}{x^2+7x+12}$

c) $\frac{x^2-4x}{x^3-64} \div \frac{2x}{2x^2+8x+32}$

5. Use rational functions in applications.

A company's cost per book for printing x particular books is given by the rational functions

$C(x) = \frac{0.8x+5000}{x}$. Find the cost per book for printing a) 300 books b) 3000 books

Teaching Notes:

- Many students need a review of simplifying, multiplying and dividing numerical fractions before attempting algebraic ones.
- Many students have trouble with problems where the factors in the numerator and denominator have opposite signs.
- Refer to the end-of-section exercises for applied problems.
- Refer students to the ***Simplifying/ Multiplying/ Dividing Rational Expressions*** chart in the text.

Answers: 1a) $\{x|x \text{ is a real number}\}$, b) $\{x|x \text{ is a real number and } x \neq 0\}$, c) $\{x|x \text{ is a real number and } x \neq 7\}$, d) $\{x|x \text{ is a real number and } x \neq -\frac{5}{7}\}$, e) $\{x|x \text{ is a real number and } x \neq -\frac{3}{2}, x \neq 1\}$; 2a) $x-3$, b) $x-9$, c) $x-5$, d) -1 , e) $\frac{y+2}{y+7}$,

f) $\frac{y^2+4y+16}{4}$; 3a) $\frac{24x}{5}$, b) $\frac{9}{x(x+7)}$, c) $\frac{x}{x-9}$; 4a) $\frac{32}{5x}$, b) $\frac{x+4}{x+1}$, c) 1; 5a) \$17.47, b) \$2.47

Mini-Lecture 6.2

Adding and Subtracting Rational Expressions

Learning Objectives:

1. Add or subtract rational expressions with common denominators.
2. Identify the Least Common Denominator (LCD) of two or more rational expressions.
3. Add or subtract rational expressions with unlike denominators.
4. Key vocabulary: *least common denominator*.

Examples:

1. Add or subtract as indicated.

a) $\frac{3}{x} + \frac{8}{x}$

b) $\frac{x^2}{x+3} - \frac{9}{x+3}$

c) $\frac{8x-5}{x^2+6x+8} + \frac{7-7x}{x^2+6x+8}$

2. Find the LCD of the rational expressions in each list.

a) $\frac{3}{11}, \frac{2}{7x}$

b) $\frac{6}{7y}, \frac{3}{y^2}$

c) $\frac{4}{x-3}, \frac{9}{x+3}$

d) $\frac{6}{x^2-y^2}, \frac{5}{x^2+2xy+y^2}, \frac{1}{8}$

3. Add or subtract as indicated. If possible, simplify your answer.

a) $\frac{5}{6y} - \frac{9}{5y}$

b) $\frac{7}{x^2} + \frac{3}{x}$

c) $\frac{6}{r} + \frac{8}{r-2}$

d) $\frac{1}{x-4} - \frac{1}{4-x}$

e) $\frac{x+3}{x^2+4x-12} + \frac{3x+2}{x^2+14x+48}$

f) $\frac{7x}{x+1} + \frac{8}{x-1} - \frac{14}{x^2-1}$

g) $\frac{10}{x^2+5x} + \frac{6}{x} - \frac{2}{x+5}$

Teaching Notes:

- Most students need a review of adding, subtracting, and finding LCDs of numerical fractions before attempting algebraic ones.
- Many students find this section difficult.
- Some students need to see more examples for objective 2. Extra time spent here is well worth it and pays off with greater success in objective 3.
- Refer students to the *Adding or Subtracting Rational Expressions with Common/Different Denominators* and *Finding the Least Common Denominator* charts in the text.

Answers: 1a) $\frac{11}{x}$, b) $x-3$, c) $\frac{1}{x+4}$; 2a) $77x$, b) $7y^2$, c) $(x-3)(x+3)$, d) $8(x+y)^2(x-y)$; 3a) $\frac{-29}{30y}$, b) $\frac{7+3x}{x^2}$, c) $\frac{14r-12}{r(r-2)}$,

d) $\frac{2}{x-4}$, e) $\frac{4x^2+7x+20}{(x-2)(x+6)(x+8)}$, f) $\frac{7x-6}{x-1}$, g) $\frac{4x+40}{x(x+5)}$

Mini-Lecture 6.3

Simplifying Complex Fractions

Learning Objectives:

1. Simplify complex fractions by simplifying the numerator and denominator and then dividing.
2. Simplify complex fractions by multiplying by a common denominator.
3. Simplify expressions with negative exponents.
4. Key vocabulary: *complex rational expression*.

Examples:

1. Simplify each complex fraction by simplifying the numerator and denominator and then dividing.

$$\text{a) } \frac{3 + \frac{1}{8}}{4 - \frac{5}{8}}$$

$$\text{b) } \frac{\frac{x}{x+4}}{\frac{4}{x+4}}$$

$$\text{c) } \frac{\frac{9}{a} + 9}{\frac{9}{a} - 9}$$

$$\text{d) } \frac{\frac{16x^2 - 25y^2}{xy}}{\frac{4}{y} - \frac{5}{x}}$$

$$\text{e) } \frac{\frac{2}{x} + \frac{9}{x^2}}{\frac{4}{x^2} - \frac{81}{x}}$$

$$\text{f) } \frac{\frac{4}{5-x} + \frac{5}{x-5}}{\frac{2}{x} + \frac{3}{x-5}}$$

$$\text{g) } \frac{\frac{4}{x+5}}{\frac{1}{x-5} - \frac{2}{x^2 - 25}}$$

$$\text{h) } \frac{\frac{3}{x+5} + \frac{9}{x+7}}{\frac{2x+11}{x^2 + 12x + 35}}$$

2. Simplify selected problems from 1a) through 1h) by multiplying the least common denominator.
3. Simplify.

$$\text{a) } \frac{x^{-2} + y^{-1}}{x^{-3}}$$

$$\text{b) } \frac{2x^{-1} + 5y^{-1}}{-7x^{-2} - 3y^{-2}}$$

$$\text{c) } \frac{-6x^{-1} + (6y)^{-1}}{x^{-2}}$$

Teaching Notes:

- Stronger students tend to prefer using the multiply by LCD method.
- Many students need to be reminded of how to deal with negative exponents before attempting objective 3.
- Refer students to the *Simplifying a Complex Fraction: Method 1/ Method 2* charts in the text.

Answers: 1a) $\frac{25}{27}$, b) $\frac{x}{4}$, c) $\frac{1+a}{1-a}$, d) $4x+5y$, e) $\frac{2x+9}{4-81x}$, f) $\frac{x}{5x-10}$, g) $\frac{4x-20}{x+3}$, h) 6; 2a-h) same as 1a-h); 3a) $\frac{xy+x^3}{y}$,

b) $\frac{2xy^2+5x^2y}{-7y^2-3x^2}$, c) $\frac{-36xy+x^2}{6y}$

Mini-Lecture 6.4

Dividing Polynomials: Long Division and Synthetic Division

Learning Objectives:

1. Divide a polynomial by a monomial.
2. Divide by a polynomial.
3. Use synthetic division to divide a polynomial by a binomial.
4. Use the remainder theorem to evaluate polynomials.

Examples:

1. Divide.

a) $8x^4 - 4x^3$ by $4x^2$ b) $\frac{3x^3y + 9x^2y^2 - 3xy^3}{3xy}$ c) $\frac{8x^5y + 32x^4y - 16x^3y^2}{-4x^4y}$

2. Divide.

a) $(x^2 + 12x + 35) \div (x + 5)$ b) $(5x^2 - 17x + 14) \div (x - 2)$
c) $(-4x^3 - 8x^2 + 7x - 1) \div (2x - 1)$ d) $(20x + 12x^2 + 3) \div (-6x - 1)$

3. Use synthetic division to divide.

a) $\frac{x^2 - 4x - 45}{x + 5}$ b) $\frac{2x^2 - 9x - 35}{x - 7}$
c) $\frac{-2x^3 - 6x^2 + 14x + 24}{x + 4}$ d) $\frac{x^4 + 16}{x - 2}$

4. Use the remainder theorem to P(c).

a) $P(x) = x^2 + 3x - 8; 2$ b) $P(x) = 5x^4 + 3x^2 - 2x + 12; -2$

Teaching Notes:

- Remind students to check their answers by multiplying.
- Encourage students to write the intermediate step $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$ when dividing by a monomial.
- Most students understand dividing by a binomial better if a numerical long division problem is shown in parallel.
- Most students understand the synthetic division process after a couple of examples.
- Most students prefer synthetic division over long division.

Answers: 1a) $2x^2 - x$, b) $x^2 + 3xy - y^2$, c) $-2x - 8 + \frac{4y}{x}$; 2a) $x + 7$, b) $5x - 7$, c) $-2x^2 - 5x + 1$, d) $-2x - 3$; 3a) $x - 9$, b) $2x + 5$,
c) $-2x^2 + 2x + 6$, d) $x^3 + 2x^2 + 4x + 8 + \frac{32}{x - 2}$ 4a) 2, b) 108

Mini-Lecture 6.5

Solving Equations Containing Rational Expressions

Learning Objectives:

1. Solve equations containing rational expressions..
2. Key vocabulary: *equation versus expression, extraneous solutions.*

Examples:

1. Solve each equation and check the solution.

a) $\frac{2}{5}y - \frac{1}{3}y = 5$

b) $\frac{3y+6}{5} = 1 + \frac{3}{4}y$

c) $\frac{14}{x} = 5 - \frac{1}{x}$

d) $\frac{x-5}{x+2} = \frac{12}{x+2}$

e) $1 + \frac{1}{x} = \frac{20}{x^2}$

f) $\frac{4x+1}{2x-5} = \frac{6x-1}{3x-6}$

g) $\frac{4}{3x} - \frac{1}{x+1} = \frac{1}{2x^2+2x}$

h) $\frac{x+6}{x^2+5x+4} - \frac{6}{x^2+2x+1} = \frac{x-6}{x^2+5x+4}$

i) $\frac{x}{x-5} - 2 = \frac{5}{x-5}$

j) $\frac{1}{x+5} + \frac{2}{x+3} = \frac{-2}{x^2+8x+15}$

Teaching Notes:

- Remind students to always determine the values not allowed for x before solving a rational expression.
- Many students are confused by the concept of an extraneous solution. Show them a simple example such as :
 $x = 3 \rightarrow x \square x = 3 \square x \rightarrow x^2 = 3x \rightarrow x^2 - 3x = 0 \rightarrow x = 0, 3; x = 0$ is extraneous.
- Some students prefer to make equivalent fractions with a common denominator, and then set the numerators equal to each other.
- Refer students to the *To Solve an Equation Containing Rational Expressions* chart in the text.

Answers: 1a) {75}, b) $\left\{\frac{4}{3}\right\}$; c) {3}, d) {17}, e) {-5,4}, f) {1}, g) $\left\{-\frac{5}{2}\right\}$, h) {2}; i) \emptyset , j) \emptyset

Mini-Lecture 6.6

Rational Equations and Problem Solving

Learning Objectives:

1. Solve an equation containing rational expressions for a specified variable.
2. Solve problems by writing equations containing rational expressions.
3. Key vocabulary: *ratio, rate, proportion.*

Examples:

1. Solve each equation for the specific variable.

a) $\frac{PV}{T} = \frac{pv}{t}$ for V

b) $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ for c

c) $P = \frac{A}{1+rt}$ for r

d) $A = \frac{1}{2}h(B+b)$ for B

e) $F = \frac{-GMm}{r^2}$ for M

f) $S = \frac{a_1 - a_n r}{1-r}$ for a_1

2. Solve.

- a) **Number** Two times the reciprocal of a number equals 4 times the reciprocal of 5. Find the number.
- b) **Proportion** The ratio of the weight of an object on Earth to an object on Planet X is 4 to 9. If a person weighs 230 pounds on Earth, find his weight on planet X. Round to the nearest whole number.
- c) **Work** One pump can drain a pool in 9 minutes. When a second pump is also used, the pool only takes 6 minutes to drain. How long would it take the second pump to drain the pool if it were the only pump in use?
- d) **Rate** Alex can run 5 miles per hour on level ground on a still day. One windy day he runs 11 miles with the wind, and in the same amount of time runs 4 miles against the wind. What is the rate of the wind?

Teaching Notes:

- Many students find this section difficult.
- Most students need to set up a chart to solve work and rate problems. Refer them to the textbook examples for samples.
- Encourage students to check whether their solutions seem reasonable.
- Refer to students to the *Solving an Equation for a Specified Variable* chart in the text.

Answers: 1a) $V = \frac{pvT}{tP}$, b) $c = \frac{ab}{b+a}$, c) $r = \frac{A-P}{Pt}$, d) $B = \frac{2A-bh}{h}$, e) $M = -\frac{Fr^2}{Gm}$, f) $a_1 = S(1-r) + a_n r$; 2a) $\frac{5}{2}$,

b) 518 pounds, c) 18 minutes, d) $2\frac{1}{3}$ mph

Mini-Lecture 6.7

Variation and Problem Solving

Learning Objectives:

1. Solve problems involving direct variation.
2. Solve problems involving inverse variation.
3. Solve problems involving joint variation.
4. Solve problems involving combined variation.
5. Key vocabulary: *constant of variation or constant of proportionality.*

Examples:

1. Find the constant of variation and the **direct** variation equation for each situation. Then solve as indicated.
 - a) $y = 4$ when $x = 3$. Find y when $x = 9$.
 - b) The amount of gas that a helicopter uses is directly proportional to the number of hours spent flying. The helicopter flies for 3 hours and uses 18 gallons of fuel. Find the number of gallons of fuel that the helicopter uses to fly for 5 hours.
2. Find the constant of variation and the **inverse** variation equation for each situation. Then solve as indicated.
 - a) $y = 4$ when $x = 3$. Find y when $x = 6$.
 - b) The amount of time it takes a swimmer to swim a race is inversely proportional to the swimmer's speed. A swimmer finishes a race in 50 seconds with a speed of 3 feet per second. Find the speed if it takes 25 seconds to finish the race.
3. Find the constant of variation and the **joint** or the **combined** variation equation for each situation. Then solve as indicated.
 - a) r varies jointly as the square of s and the square of t . $r = 12$ when $s = 1$ and $t = 2$.
 - b) x is directly proportional to y and inversely proportional to the cube of z . $x = 3$ when $y = 3$ and $z = 2$.
 - c) The volume V of a given mass of gas varies directly as the temperature T and inversely as the pressure P . A measuring device is calibrated to give $V = 300 \text{ in}^3$ when $T = 250^\circ$ and $P = 10 \text{ lb/in}^2$. What is the volume on this device when the temperature is 370° and the pressure is 20 lb/in^2 ?

Teaching Notes:

- Most students will understand the concepts of direct and inverse variation better if real-life examples are discussed in a qualitative way for problem 1.
- Some students are confused by solving for the constant of variation and then using that constant in the original equation and solving for a different variable.

Answers: 1a) $k = \frac{4}{3}, y = \frac{4}{3}x, y = 12$, b) $k = 6, g = 6h, 30 \text{ gallons of fuel}$; 2a) $k = 12, y = \frac{12}{x}, y = 2$, b) $k = 150, t = \frac{150}{s}, 6 \text{ feet per second}$; 3a) $k = 3, r = 3s^2t^2$, b) $k = 8, x = \frac{8y}{z^3}$, c) $k = 12, V = \frac{12T}{P}, 222 \text{ in}^3$

Additional Exercises 6.1

Form I

Name _____

Date _____

Find the domain of each rational expression.

1. $f(x) = \frac{x+3}{x}$

1. _____

2. $f(x) = \frac{x}{x-2}$

2. _____

3. $f(x) = \frac{x^2+16}{(x-4)(x+4)}$

3. _____

Simplify each rational expression.

4. $\frac{12x^2y^3}{6xy}$

4. _____

5. $\frac{x+6}{x+6}$

5. _____

6. $\frac{18ab^5+12a^3b}{6ab}$

6. _____

7. $\frac{x^2+3x}{x^2+6x+9}$

7. _____

Perform each indicated operation and simplify.

8. $\frac{3x}{2y} \cdot \frac{y^2}{6}$

8. _____

9. $\frac{x-4}{2x+3} \cdot \frac{4x+6}{x-4}$

9. _____

10. $\frac{1+3m}{m-4} \cdot \frac{m-4}{3m^2-5m-2}$

10. _____

11. $\frac{36y}{7z^2} \div \frac{3xy}{2z}$

11. _____

12. $\frac{4x-12}{x-10} \div \frac{x^2-5x+6}{x-10}$

12. _____

Additional Exercises 6.1

Form II

Name _____

Date _____

Find the domain of each rational expression.

1. $f(x) = \frac{x+3}{x-3}$

1. _____

2. $f(x) = \frac{x^2+16}{(x-4)(x+4)}$

2. _____

3. $f(x) = \frac{x-1}{x^2+6x-7}$

3. _____

Simplify each rational expression.

4. $\frac{3x}{6x+9}$

4. _____

5. $\frac{x-7}{7-x}$

5. _____

6. $\frac{17ab^2-12a^3b}{6ab}$

6. _____

7. $\frac{x^2-2x}{x^2-4x+4}$

7. _____

Perform each indicated operation and simplify.

8. $\frac{-6xy^2}{4y} \cdot \frac{3xy^3}{6x^3}$

8. _____

9. $\frac{6-x}{2x+5} \cdot \frac{2x}{-x+6}$

9. _____

10. $\frac{1+3m}{4-m} \cdot \frac{m-4}{3m^2-5m-2}$

10. _____

11. $\frac{x-3}{x} \div \frac{x^2+3x-18}{x^2}$

11. _____

12. $\frac{4x-12}{x-12} \div \frac{x^2-7x+12}{x-12}$

12. _____

Additional Exercises 6.1

Form III

Name _____

Date _____

Find the domain of each rational expression.

1. $f(x) = \frac{x^2}{x+3}$

1. _____

2. $f(x) = \frac{2-x}{x^2-4}$

2. _____

3. $f(x) = \frac{x^3 - 5x^2 + 5x - 4}{4}$

3. _____

Simplify each rational expression.

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

4. _____

5. $\frac{2x^2 + 5x - 12}{2x - 3}$

5. _____

6. $\frac{18ab^5 - 12a^3b}{6ab}$

6. _____

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

7. _____

Perform each indicated operation and simplify.

8. $\frac{x^2 - 6x - 7}{7 - x} \cdot \frac{x}{x + 1}$

8. _____

9. $\frac{4x - 12}{x - 1} \cdot \frac{x - 1}{x^2 - 7x + 12}$

9. _____

10. $\frac{x^2 - 16}{x - 1} \div \frac{x^2 - 3x - 4}{x^2 - 2x + 1}$

10. _____

11. $\frac{1 + 3m}{4 - m} \cdot \frac{m - 4}{2 + 5m - 3m^2}$

11. _____

12. $\frac{x + 2}{x^2 - 4x - 12} \cdot \frac{x^2 - 9x + 18}{x - 2} \div \frac{x^2 + 5x + 6}{x^2 - 4}$

12. _____

Additional Exercises 6.2

Form I

Name _____

Date _____

Add or subtract as indicated. Simplify each answer.

1. $\frac{z}{3} + \frac{2z}{3}$

1. _____

2. $\frac{6}{x-3} - \frac{2x}{x-3}$

2. _____

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

3. _____

Find the LCD of the rational expressions in each list.

4. $\frac{2x}{x-4}, \frac{x-1}{x+4}$

4. _____

5. $\frac{4x-3}{x-7}, \frac{2x+8}{7-x}$

5. _____

6. $\frac{5}{8x^4}, \frac{7}{12x^6}$

6. _____

Add or subtract as indicated. Simplify each answer.

7. $\frac{4}{3x} + \frac{5}{3x^2}$

7. _____

8. $\frac{2x+3}{x^2-7x+12} - \frac{2}{x-3}$

8. _____

9. $\frac{5}{x} + \frac{5}{x-1}$

9. _____

10. $\frac{x}{x-2} + \frac{3}{x+2}$

10. _____

11. $\frac{4x-3}{x-7} + \frac{2x+8}{7-x}$

11. _____

12. $\frac{2x}{x-4} - \frac{x+4}{x+4}$

12. _____

Additional Exercises 6.2

Form II

Name _____

Date _____

Add or subtract as indicated. Simplify each answer.

1. $\frac{y-3}{4} + \frac{7y}{4}$

1. _____

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

2. _____

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

3. _____

Find the LCD of the rational expressions in each list.

4. $\frac{1}{3x^2}, \frac{9}{15x^4}$

4. _____

5. $\frac{2x-3}{x-2}, \frac{x}{x^2-4}$

5. _____

6. $\frac{3x+5}{x^2-16}, \frac{2}{x^2+8x+16}$

6. _____

Add or subtract as indicated. Simplify each answer.

7. $\frac{6}{7x} + \frac{3}{5}$

7. _____

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

8. _____

9. $\frac{2x-3}{x^2-7x+12} + \frac{2}{x-3}$

9. _____

10. $\frac{2}{x-3} - \frac{4}{x-1}$

10. _____

11. $\frac{3}{x^2+2x-8} + \frac{2}{x^2-3x+2}$

11. _____

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

12. _____

Additional Exercises 6.2

Form III

Name _____

Date _____

Add or subtract as indicated. Simplify each answer.

1. $\frac{y-7}{3} - \frac{2}{3}$

1. _____

2. $\frac{2}{x+1} - \frac{x-7}{x+1}$

2. _____

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

3. _____

Find the LCD of the rational expressions in each list.

4. $\frac{3}{8z^4}, \frac{-1}{12z^3}$

4. _____

5. $\frac{2x}{x^2+4x-5}, \frac{4}{x^2+2x-3}$

5. _____

6. $\frac{4}{x^2+x-6}, \frac{x}{x+3}, \frac{5}{x-2}$

6. _____

Add or subtract as indicated. Simplify each answer.

7. $\frac{x+5}{x-5} - \frac{x-5}{x+5}$

7. _____

8. $\frac{6}{x-3} - \frac{1}{3-x}$

8. _____

9. $\frac{3x+6}{x^2-4x-12} - \frac{2x+4}{x^2-6x-16}$

9. _____

10. $\frac{3}{x^2+2x-8} - \frac{2}{x^2-3x+2}$

10. _____

11. $\frac{x-4}{x^2+5x+6} + \frac{5x+6}{x^2+4x+3}$

11. _____

12. $\frac{x}{x-2} + \frac{3}{x+2} + \frac{4}{x^2-4}$

12. _____

Additional Exercises 6.3

Form I

Name _____

Date _____

Simplify each complex fraction.

1. $\frac{\frac{14}{x}}{\frac{2}{x}}$

1. _____

2. $\frac{\frac{3x}{10}}{\frac{6x}{25}}$

2. _____

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

3. _____

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

4. _____

5. $\frac{\frac{4}{ab} - \frac{3}{b^2}}{\frac{1}{a} + \frac{3}{b}}$

5. _____

6. $\frac{\frac{2}{x-3} - \frac{3}{x^2-9}}{\frac{4}{x^2-9} - \frac{2}{x-3}}$

6. _____

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

7. _____

8. $\frac{a^{-2} + b^{-2}}{a^{-1} + b^{-1}}$

8. _____

Additional Exercises 6.3 (*cont.*)

Name _____

9. $\frac{a^{-1} + 3ab^{-1}}{a^{-2} + a^{-2}b}$

9. _____

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

10. _____

Additional Exercises 6.3

Form II

Name _____

Date _____

Simplify each complex fraction.

1. $\frac{\frac{4x}{45}}{\frac{12x}{25}}$

1. _____

2. $\frac{\frac{x}{9}}{\frac{3x}{2}}$

2. _____

3. $\frac{\frac{4}{ab} - \frac{3}{b^2}}{\frac{1}{a} + \frac{3}{b}}$

3. _____

4. $\frac{\frac{2-3x}{4}}{\frac{3+4x}{6}}$

4. _____

5. $\frac{a + \frac{b}{a}}{b + \frac{a}{b}}$

5. _____

6. $\frac{x}{x^{-1} + 4}$

6. _____

7. $\frac{a^{-2} - b^{-2}}{a^{-1} + b^{-1}}$

7. _____

8. $\frac{\frac{x-1}{x} + \frac{x-2}{x-1}}{\frac{x+2}{x} + \frac{x+1}{x-1}}$

8. _____

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

9. _____

Additional Exercises 6.3 (*cont.*)

Name _____

10. $\frac{5x^{-1} + (5x)^{-1}}{x^{-1} + 5x^{-2}}$

10. _____

Additional Exercises 6.3

Form III

Name _____

Date _____

Simplify each complex fraction.

1.
$$\frac{\frac{7x}{9}}{\frac{49}{3x}}$$

1. _____

2.
$$\frac{\frac{2x^2y}{3yz}}{\frac{6}{xz}}$$

2. _____

3.
$$\frac{\frac{5-x}{2}}{\frac{x-5}{6}}$$

3. _____

4.
$$\frac{\frac{1}{y} + \frac{3}{x}}{\frac{5}{y} - \frac{6}{x}}$$

4. _____

5.
$$\frac{x^{-2}}{2-x^{-1}}$$

5. _____

6.
$$\frac{\frac{1}{ab} - \frac{3}{b^2}}{\frac{1}{a} - \frac{3}{b}}$$

6. _____

7.
$$\frac{\frac{x-1}{x+2} - \frac{x+2}{x-1}}{\frac{x}{x+2} + \frac{x-1}{x-1}}$$

7. _____

8.
$$\frac{\frac{2}{4-x} + \frac{3}{x-4}}{\frac{1}{x} + \frac{5}{x-4}}$$

8. _____

Additional Exercises 6.3 (cont.)

Name _____

9. $\frac{x^{-1} + (5x)^{-1}}{5x^{-1} + 5x^{-2}}$

10. $\frac{5y^{-1} + (2x)^{-1}}{(2y)^{-2} - x^{-2}}$

9. _____

10. _____

Additional Exercises 6.4

Form I

Name _____

Date _____

Divide

1. $(60x^4 + 50x^2 - 20x) \div (10x)$

1. _____

2. $\frac{14x^2y^2 + 7xy^3 - 21xy^4}{7xy}$

2. _____

3. $\frac{42x^5y^2 - 36x^4y^3}{6x^2y}$

3. _____

4. $(x^2 + 13x + 36) \div (x + 9)$

4. _____

5. $(x^2 + 3x - 4) \div (x + 2)$

5. _____

6. $(x^2 - 9) \div (x - 3)$

6. _____

7. $(x^2 - 7x + 12) \div (x - 3)$

7. _____

8. $(3x^3 + 5x^2 - 10x - 2) \div (x - 2)$

8. _____

9. $(x^3 - 8x^2 - 4x + 32) \div (x - 8)$

9. _____

10. $(6x^3 - 8x^2 + 3x - 4) \div (3x - 4)$

10. _____

11. $(x^3 - 6x^2 + 3x - 18) \div (x + 2)$

11. _____

12. $(t^3 - 1) \div (t - 1)$

12. _____

13. $(7x^4 + 30x^3 - 30x - 10) \div (x + 4)$

13. _____

Additional Exercises 6.4

Form II

Name _____

Date _____

Divide

1. $\frac{8x^2 + 2x - 3}{x}$

2. $(24a^2b^2 - 18a^2b) \div 6ab$

3. $\frac{16x^4y^3 + 12x^3y^2 - 6x^2y}{2xy}$

4. $(x^2 + 25x + 100) \div (x + 5)$

5. $(12x^2 - 71x - 6) \div (x - 6)$

6. $(x^2 - 14x + 24) \div (x - 2)$

7. $(x^2 - 5x - 6) \div (x + 1)$

8. $(x^2 - 4) \div (x + 2)$

9. $(x^3 + 5x^2 + 6x + 30) \div (x + 5)$

10. $(36t^4 - 169t^2 + 100) \div (6t - 5)$

11. $(4x^3 - 6x^2 + 1) \div (2x + 3)$

12. $(27t^3 - 1) \div (3t - 1)$

13. $(6 - 2x - x^2) \div (2 - x)$

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

Additional Exercises 6.4

Form III

Name _____

Date _____

Divide

1. $(60x^4 - 30x^2 + 20x) \div (-10x)$

1. _____

2. $\frac{12x^2y + 6xy^2 - xy}{xy}$

2. _____

3. $\frac{16a^6b^3 + 20a^4b}{4a^3b}$

3. _____

4. $(x^2 + 25x + 100) \div (x + 20)$

4. _____

5. $(x^2 - 13x + 36) \div (x - 4)$

5. _____

6. $(8x^2 + 2x - 3) \div (2x - 1)$

6. _____

7. $(6x^3 - 8x^2 + 3x - 6) \div (3x - 4)$

7. _____

8. $(t^3 - 125) \div (t - 5)$

8. _____

9. $(3x^3 - 5x^2 + x - 2) \div (x - 2)$

9. _____

10. $(3x^3 + 4x^2 - 7x + 2) \div \left(x - \frac{2}{3}\right)$

10. _____

11. $(2x^4 + x^3 - x - 2) \div (x + 1)$

11. _____

12. $(27t^3 + 8) \div (3t + 2)$

12. _____

13. $(6t^4 + 5t^3 - 10t + 4) \div \left(t - \frac{2}{3}\right)$

13. _____

Additional Exercises 6.5

Form I

Name _____

Date _____

Solve.

1. $\frac{x}{5} + \frac{2}{3} = \frac{4x}{15}$

1. _____

2. $\frac{3}{10z} + \frac{3+z}{z} = \frac{7}{10}$

2. _____

3. $\frac{3}{y} - \frac{y-2}{3y} = \frac{4}{y}$

3. _____

4. $\frac{-1}{2x+3} = \frac{4x-7}{2x+3}$

4. _____

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

5. _____

6. $\frac{3}{x+4} = \frac{2(x+1)}{x+4}$

6. _____

7. $\frac{50}{x+5} = \frac{30}{x-5}$

7. _____

8. $\frac{x+1}{x-2} = \frac{x+10}{x+4}$

8. _____

9. $\frac{3}{2} + \frac{x}{x-3} = \frac{3}{x-3}$

9. _____

10. $\frac{8}{x^2-9} + \frac{4}{x+3} = \frac{2}{x-3}$

10. _____

11. $\frac{1}{x-1} - \frac{1}{x+1} = \frac{3x}{x^2-1}$

11. _____

12. $\frac{3x}{x-4} - \frac{6}{x^2-7x+12} = \frac{2x}{x-3}$

12. _____

Additional Exercises 6.5

Form II

Name _____

Date _____

Solve.

1. $\frac{3x}{5} + \frac{2}{3} = \frac{x}{15}$

1. _____

2. $\frac{3}{y} + \frac{y-2}{2y} = \frac{4}{y}$

2. _____

3. $\frac{6}{x} + \frac{x+4}{5x} = \frac{3}{5}$

3. _____

4. $\frac{x-1}{x-5} = \frac{4}{x-5}$

4. _____

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

5. _____

6. $\frac{x-4}{2x-1} = \frac{3(x-1)}{2x-1}$

6. _____

7. $\frac{2}{x+1} = \frac{1}{x-2}$

7. _____

8. $\frac{1}{x-3} + \frac{1}{x+3} = \frac{5}{x^2-9}$

8. _____

9. $\frac{2}{x-2} - \frac{5}{x^2-x-2} = \frac{1}{x+1}$

9. _____

10. $\frac{3x}{3x-1} + \frac{1}{x} = \frac{1}{3x-1}$

10. _____

11. $\frac{-2}{x+3} = \frac{1}{x+6} - \frac{6}{x^2+9x+18}$

11. _____

12. $\frac{z}{6z^2+z-2} + \frac{1}{2z-1} = \frac{3}{6z+4}$

12. _____

Additional Exercises 6.5

Form III

Name _____

Date _____

Solve.

1. $\frac{x}{7} - \frac{3}{14} = \frac{x}{2}$

1. _____

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

2. _____

3. $\frac{4}{y} - \frac{2y+1}{y} = \frac{3}{y}$

3. _____

4. $\frac{x+5}{x-3} = \frac{2(x-1)}{x-3}$

4. _____

5. $\frac{y+1}{y+4} = \frac{3(y-3)}{y+4}$

5. _____

6. $\frac{2(x-4)}{7x-4} = \frac{x-5}{7x-4}$

6. _____

7. $\frac{2x}{x-3} - \frac{4}{x-3} = \frac{x}{x-3}$

7. _____

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

8. _____

9. $\frac{3}{2} + \frac{x}{x-5} = \frac{-5}{x-5}$

9. _____

10. $\frac{4}{4x-1} - \frac{1}{x} = \frac{1}{4x-1}$

10. _____

11. $\frac{2}{x+3} - \frac{1}{x+6} = \frac{6}{x^2+9x+18}$

11. _____

12. $\frac{2}{x^2-1} - \frac{1}{2} = \frac{1}{x-1}$

12. _____

Additional Exercises 6.6

Form I

Name _____

Date _____

Solve each equation for the specified variable.

1. $\frac{1}{x} - \frac{1}{y} = \frac{1}{2}$ for x

2. $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ for a

1. _____

2. _____

Solve.

3. Find the number that when subtracted from the numerator and subtracted from the denominator of $\frac{4}{9}$ results in a fraction equivalent to $\frac{1}{6}$.

3. _____

4. If a certain number is subtracted from the numerator and added to the denominator of $\frac{7}{19}$, the new fraction is equivalent to $\frac{1}{12}$. Find the number.

4. _____

5. Find the number that when subtracted from the numerator and added to the denominator of $\frac{3}{7}$ results in a fraction equivalent to $\frac{1}{9}$.

5. _____

6. In the United States, 1 out of 60 homes is heated by wood. At this rate, how many homes in a community of 3,000 homes are heated by wood? (*Source: 2005 American Housing Survey for the United States*)

6. _____

7. In a foreign country, 1 out of 20 homes is heated by wood. At this rate, how many homes in a community of 3,000 homes are heated by wood?

7. _____

8. In the United States, 1 out of 12 homes is heated by fuel oil. At this rate, how many homes in a community of 12,000 homes are heated by fuel oil? (*Source: 2005 American Housing Survey for the United States*)

8. _____

9. Sidney can mow the lawn in 4 hours using her riding mower. Her son can mow the same lawn in 12 hours using a push mower. How long would it take them to mow the lawn working together?

9. _____

10. Will Wilson takes 6 hours to shoot a movie scene. It takes Steve Nugent twice as long to do the same the job. How long will it take them to shoot the scene, working together?

10. _____

Additional Exercises 6.6 (*cont.*)

Name _____

11. Pat can wash the family's cars in 2 hours. Pat's son Tom can do the same job in 3 hours. How long will it take them to wash the family's cars working together?

11. _____

12. James Lawson takes $1\frac{1}{2}$ times as long to go 48 miles upstream as he does to return. If the boat cruises at 20 mph in still water, what is the speed of the current?

12. _____

13. John Williams takes $\frac{7}{9}$ times as long to go 70 miles downstream as he does to return. If the boat cruises at 40 mph in still water, what is the speed of the current?

13. _____

Additional Exercises 6.6

Form II

Name _____

Date _____

Solve each equation for the specified variable.

1. $\frac{1}{x} - \frac{1}{y} = \frac{1}{2}$ for y

1. _____

2. $\frac{1}{m} = \frac{1}{n} + \frac{1}{p}$ for p

2. _____

Solve.

3. Find the number that when added to the numerator and subtracted from the denominator of $\frac{11}{21}$ results in a fraction equivalent to $\frac{9}{7}$.

3. _____

4. Find the number that when added to the numerator and subtracted from the denominator of $\frac{1}{12}$ results in a fraction equivalent to $\frac{4}{9}$.

4. _____

5. If a certain number is added to the numerator and subtracted from the denominator of $\frac{4}{11}$, the new fraction is equivalent to $\frac{3}{2}$. Find the number.

5. _____

6. In the United States, 1 out of 12 homes is heated by fuel oil. At this rate, how many homes in a community of 24,000 homes are heated by fuel oil? (*Source: 2005 American Housing Survey for the United States*)

6. _____

7. In a foreign country, 1 out of 20 homes is heated by wood. At this rate, how many homes in a community of 6,000 homes are heated by wood?

7. _____

8. In the United States, 1 out of 60 homes is heated by wood. At this rate, how many homes in a community of 15,000 homes are heated by wood? (*Source: 2005 American Housing Survey for the United States*)

8. _____

Additional Exercises 6.6 (cont.)

Name _____

9. It takes Sam 8 hours to build a section of fence. When David helps him, they can build a section in 3 hours. How long would it take David to build a section working alone?

9. _____

10. Grant Wilson takes 6 hours to shoot a movie scene. Steven Moss can do the same job in half the time. How long will it take them to shoot the scene, working together?

10. _____

11. Juan Ramirez can clean the animal cages at the zoo where he works in 4 hours. His supervisor can do the same job in 3 hours. How long will it take them to clean the animal cages at the zoo if they work together?

11. _____

12. Alex Baxter takes $1\frac{2}{3}$ times as long to go 75 miles upstream as he does to return. If the boat cruises at 20 mph in still water, what is the speed of the current?

12. _____

13. Lance Greyson takes $\frac{3}{5}$ as long to go 90 miles downstream as he does to return. If the boat cruises at 24 mph in still water, what is the speed of the current?

13. _____

Additional Exercises 6.6

Form III

Name _____

Date _____

Solve each equation for the specified variable.

1. $\frac{1}{m} = \frac{1}{n} + \frac{1}{p}$ for m

1. _____

2. $\frac{1}{a} - \frac{1}{b} = \frac{1}{c}$ for b

2. _____

Solve.

3. If a certain number is subtracted from the numerator and subtracted from the denominator of $\frac{4}{9}$, the new fraction is equivalent to $\frac{1}{6}$. Find the number.

3. _____

4. If a certain number is added to the numerator and subtracted from the denominator of $\frac{11}{21}$, the new fraction is equivalent to $\frac{9}{7}$. Find the number.

4. _____

5. Find the number that when added to the numerator and added to the denominator of $\frac{11}{21}$ results in a fraction equivalent to $\frac{9}{14}$.

5. _____

6. In the United States, 1 out of 12 homes is heated by fuel oil. At this rate, how many homes in a community of 48,000 homes are heated by fuel oil? (Source: 2005 American Housing Survey for the United States)

6. _____

7. In a foreign country, 1 out of 20 homes is heated by wood. At this rate, how many homes in a community of 30,000 homes are heated by wood?

7. _____

8. In the United States, 1 out of 60 homes is heated by wood. At this rate, how many homes in a community of 8520 homes are heated by wood? (Source: 2005 American Housing Survey for the United States)

8. _____

Additional Exercises 6.6 (cont.)

Name _____

9. John Williams takes $1\frac{2}{7}$ times as long to go 70 miles upstream as he does to return. If the boat cruises at 40 mph in still water, what is the speed of the current?

9. _____

10. One model airplane travels 30 kilometers per hour faster than another. The faster plane can travel 400 km in the same time the slower plane travels 250 km. Find the speed of both planes.

10. _____

11. Lance Jones takes $1\frac{2}{3}$ times as long to go 90 miles upstream as he does to return. If the boat cruises at 24 mph in still water, what is the speed of the current?

11. _____

12. Alex Wilson takes 6 hours to shoot a movie scene. Pat Morrison can do the same job in one third the time. How long will it take them to shoot the scene, working together?

12. _____

13. Jack can mow the lawn in 12 hours using a push mower. Fran can mow the same lawn in 4 hours using her riding mower. How long would it take them to mow the lawn working together?

13. _____

Additional Exercises 6.7

Form I

Name _____

Date _____

If y varies directly as x , find the constant of variation and the direct variation equation for each situation.

1. $y = 6$ when $x = 3$

2. $y = \frac{1}{3}$ when $x = 6$

Solve.

3. The distance a car travels at a fixed rate varies directly as the time. If a car travels 120 miles in 2 hours, how long would it take to travel 600 miles?

4. The volume of a gas at a constant temperature varies inversely as the pressure. Find the volume of a gas under a pressure of 30 pounds if the gas occupies 15 cubic centimeters under a pressure of 20 pounds.

If y varies inversely as x , find the constant of variation and the direct variation equation for each situation.

5. $y = 10$ when $x = 7$

6. $y = 0.5$ when $x = 3$

Find the constant of variation and the variation equation for each situation.

7. y varies jointly as x and the square root of z ; $y = 210$ when $x = 10$, $z = 49$

8. a varies directly as the square of b and inversely as the cube of c ; $a = 3$ when $b = 4$, $c = 2$

Solve.

9. Hooke's law states that the distance a spring stretches is directly proportional to the weight attached to the spring. If a 30-pound weight attached to the spring stretches the spring 5 inches, find the distance that a 45-pound weight attached to the spring stretches the spring.

10. The period (the time required to complete one swing) of a simple pendulum varies directly as the square root of its length. If a pendulum 16 feet long has a period of 3 seconds, find the period of a pendulum 25 feet long.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Additional Exercises 6.7

Form II

Name _____

Date _____

If y varies directly as x , find the constant of variation and the direct variation equation for each situation.

1. $y = 9$ when $x = 21$

2. $y = \frac{1}{2}$ when $x = 6$

1. _____

2. _____

Solve.

3. The distance a car travels at a fixed rate varies directly as the time. If a car travels 325 miles in 5 hours, how long would it take to travel 780 miles?

3. _____

4. The volume of a gas at a constant temperature varies inversely as the pressure. Find the volume of a gas under a pressure of 25 pounds if the gas occupies 15 cubic centimeters under a pressure of 20 pounds.

4. _____

If y varies inversely as x , find the constant of variation and the direct variation equation for each situation.

5. $y = 20$ when $x = 3$

5. _____

6. $y = 0.8$ when $x = 1.4$

6. _____

Find the constant of variation and the variation equation for each situation.

7. y varies jointly as x and the square root of z ; $y = 140$ when $x = 10$, $z = 49$

7. _____

8. a varies directly as the square of b and inversely as the cube root of c ; $a = 2$ when $b = 4$, $c = 64$

8. _____

Solve.

9. The distance that a freely falling body falls varies directly as the square of the time it falls. If a body falls 400 feet in 5 seconds, how far does it fall in 3 seconds?

9. _____

10. The period (the time required to complete one swing) of a simple pendulum varies directly as the square root of its length. If a pendulum 12 feet long has a period of 4 seconds, find the period of a pendulum 3 feet long.

10. _____

Additional Exercises 6.7

Form III

Name _____

Date _____

If y varies directly as x , find the constant of variation and the direct variation equation for each situation.

1. $y = 9$ when $x = 27$

1. _____

2. $y = 0.7$ when $x = 14$

2. _____

Solve.

3. The time required for a car to travel a fixed distance varies inversely as the rate at which it travels. If it takes 5 hours at 64 mph to travel the distance, how long will it take at 60 mph?

3. _____

4. The volume of a gas at a constant temperature varies inversely as the pressure. Find the volume of a gas under a pressure of 24 pounds if the gas occupies 12 cubic centimeters under a pressure of 20 pounds.

4. _____

If y varies inversely as x , find the constant of variation and the direct variation equation for each situation.

5. $y = 20$ when $x = 6$

5. _____

6. $y = \frac{1}{5}$ when $x = 30$

6. _____

Find the constant of variation and the variation equation for each situation.

7. y varies jointly as x and the square root of z ; $y = 120$ when $x = 10$, $z = 36$

7. _____

8. v varies jointly as h and the square of r ; $v = 3072$ when $h = 8$, $r = 4$

8. _____

Solve.

9. Hooke's law states that the distance a spring stretches is directly proportional to the weight attached to the spring. If a 20-pound weight attached to the spring stretches the spring 2 inches, find the distance that a 35-pound weight attached to the spring stretches the spring.

9. _____

10. The period (the time required to complete one swing) of a simple pendulum varies directly as the square root of its length. If a pendulum 10 feet long has a period of 2 seconds, find the period of a pendulum 40 feet long.

10. _____

Name:
Instructor:

Date:
Section:

Section 6.1 Rational Functions and Multiplying and Dividing Rational Expressions

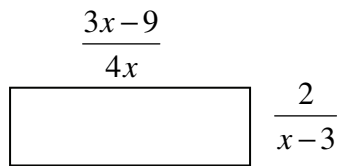
Objective: Provide practice with multiplying and dividing rational expressions.

Suggested Format: Small Group

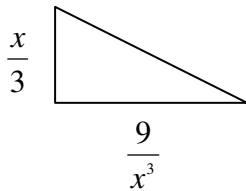
Time: 20 minutes

Find a simplified expression for the area of the figure.

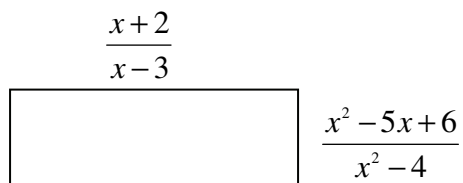
1. $A = lw$



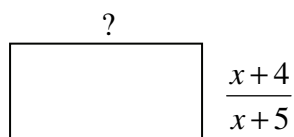
2. $A = \frac{1}{2}bh$



3. $A = lw$



4. Find a simplified expression for the missing side of the rectangle if $A = \frac{x^2+x-12}{x^2+7x+10}$.



Name:
Instructor:

Date:
Section:

Section 6.7 Variation and Problem Solving

Objective: Apply concepts of direct and inverse variation.

Suggested Format: Small Group

Time: 20 minutes

The daily sales, S , of Java Jay's Coffee Shop varies directly as their advertising budget, A , and inversely with the price, P , of a cup of coffee. When the advertising budget is \$25 per day the coffee shop sells 180 cups of coffee at \$1.50 each.

1. Describe what it means for " S to vary directly as A ."
2. Describe what it means for " S to vary indirectly as P ."
3. Solve for the constant of variation and use this value to write an equation expressing S in terms of A and P .
4. What are the expected daily sales if the price of a cup of coffee goes up to \$1.75 per cup but the advertising budget remains at \$25 per day?
5. What are the expected daily sales if the advertising budget is increased to \$30 per day and the price of coffee remains at \$1.50 per cup?

Name:
Instructor:

Date:
Section:

Chapter 6 Test Form A

1. Find the domain of the rational expression.

$$f(x) = \frac{x-3}{x^2+3x-10}$$

1. _____

Write each rational expression in lowest terms.

2. $\frac{-36x^4y^6}{10x^6y^3}$

2. _____

3. $\frac{3x-21}{x^2-2x-35}$

3. _____

Perform the indicated operations. Write answers in lowest terms.

4. $\frac{x^2+6x+9}{12x} \cdot \frac{3x^2}{x^2-9}$

4. _____

5. $\frac{x^2+5x+4}{2x^2+4x-16} \div \frac{x^2-x-2}{3x^2-x-2}$

5. _____

6. $\frac{5x-15}{10x^2-40} \div \frac{x^2+x-12}{x^2+7x+10}$

6. _____

7. $\frac{x^2-2x-24}{x^2-36} \cdot \frac{3x^2-13x+4}{4x^2-6x-40} \div \frac{3x^2+11x-4}{4x^2-14x-60}$

7. _____

8. $\frac{x-6}{x+5} + \frac{3-x}{x+5}$

8. _____

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

9. _____

10. $\frac{3}{x-4} - \frac{2}{x+4} - \frac{24}{x^2-16}$

10. _____

11. $\frac{4}{x^2-3x-10} + \frac{x}{x^2-9x+20}$

11. _____

Name:
Instructor:

Date:
Section:

Chapter 6 Test Form A *cont'd*

Simplify each complex fraction.

12. $\frac{\frac{4}{x^5}}{\frac{12}{x^7}}$

12. _____

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

13. _____

14. $\frac{2 + \frac{3}{x-5}}{4 - \frac{1}{x-5}}$

14. _____

Divide.

15. $\frac{8x^2y - 4x^2 + 6xy}{2x^2y}$

15. _____

16. $\frac{4x^3 + 6x^2 - 8x + 4}{2x - 1}$

16. _____

17. Use synthetic division to divide.
 $(3x^4 - 2x^3 - 6x^2 + 5x - 8)$ by $(x - 4)$

17. _____

18. If $P(x) = 4x^4 - 2x^3 - 3x + 11$, use the remainder theorem to find $P(-2)$.

18. _____

19. Solve for y . $x = \frac{4y + 6}{3}$

19. _____

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Chapter 6 Test Form A *cont'd*

Solve each equation for x .

20. $\frac{2}{x} + \frac{1}{3} = \frac{4}{x}$ 20. _____

21. $\frac{3x-1}{5-8x} = -\frac{1}{3}$ 21. _____

22. $\frac{3}{x-2} + \frac{x}{x+2} = -\frac{8}{3}$ 22. _____

23. $\frac{x+5}{x^2+7x+10} = \frac{1}{2x+10} - \frac{1}{x+2}$ 23. _____

24. The speed of a boat in still water is 20 mph. If the boat travels 140 miles downstream in the same time that it takes to travel 92 miles upstream, find the current of the stream. 24. _____

25. Suppose that w is directly proportional to y and inversely proportional to v . If $w = 12$ when $v = 20$ and $y = 10$, find w when $v = 30$ and $y = 5$. 25. _____

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Chapter 6 Test Form B

Find the domain of each rational function.

1. $\frac{x-2}{x^2+16}$ 1. _____

2. $\frac{3x-9}{x^2+2x-15}$ 2. _____

Write each rational expression in lowest terms.

3. $\frac{12x^3y-36x^2y}{48xy^2-16x^3y^2}$ 3. _____

4. $\frac{x^2-5x-24}{x^2-x-12}$ 4. _____

Perform the indicated operation. Write answers in lowest terms.

5. $\frac{27x^2y^4}{16y^3z} \cdot \frac{24xyz^2}{18x^3y^5}$ 5. _____

6. $\frac{a+3b}{2a-2b} \cdot \frac{a^2-b^2}{a^2+3ab}$ 6. _____

7. $\frac{3x+12}{x} \div \frac{x^2+5x+4}{2x^2}$ 7. _____

8. $\frac{3p+p^2}{p^3+27} \div \frac{p}{p^2-3p+9}$ 8. _____

9. $\frac{x+1}{x+2} - \frac{3x+5}{x+2}$ 9. _____

10. $\frac{3}{x^2-x-6} + \frac{2}{x^2+x-12}$ 10. _____

11. $5 - \frac{2}{x-3}$ 11. _____

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Chapter 6 Test Form B *cont'd*

Divide.

12. $\frac{18x^2y^2 - 12xy^2 + 24xy}{6xy}$ 12. _____

13. $\frac{4x^3 + 3x - 4}{2x + 1}$ 13. _____

14. Use synthetic division to divide.
 $(x^4 + 2x^2 - 3x + 1)$ by $(x + 1)$ 14. _____

15. If $P(x) = 2x^4 + 7x^2 - 11x + 2$, find $P(2)$. 15. _____

Simplify the complex fractions.

16. $\frac{\frac{2x-6}{3x^2}}{\frac{x-3}{9x}}$ 16. _____

17. $\frac{\frac{2}{x} + \frac{3}{2x}}{\frac{3}{5x} - \frac{2}{3}}$ 17. _____

18. $\frac{x^{-2}}{x^{-1} - x^{-2}}$ 18. _____

Solve each equation for x .

19. $\frac{1}{5-x} + \frac{2}{x-5} = -\frac{1}{2}$ 19. _____

20. $6 + \frac{18}{x} = 8$ 20. _____

21. $2 - \frac{1}{x} - \frac{10}{x^2} = 0$ 21. _____

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Chapter 6 Test Form B *cont'd*

22. $\frac{1}{x-2} - \frac{2x}{x^2+3x-10} = \frac{3}{x+5}$

22. _____

23. If a number is subtracted from the numerator of $\frac{3}{5}$ and the same number is added to the denominator of $\frac{3}{5}$, the result is equivalent to 1. Find the number.

23. _____

24. Suppose that w is proportional to the square root of v . If w is 20 when v is 16, find w when v is 9.

24. _____

25. Suppose that b is directly proportional to c , and inversely proportional to d . If $b = 6$ when $c = 12$ and $d = 6$, find b when $c = 28$ and $d = 8$.

25. _____

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Chapter 6 Test Form C

1. Find the domain of the rational function.

$$f(x) = \frac{x-7}{x^2-4x-12}$$

1. _____

Write each rational expression in lowest terms.

2. $\frac{100a^3bc^2}{40a^4c}$

2. _____

3. $\frac{2x^2-2x-40}{x^2-25}$

3. _____

4. $\frac{xy-4y-3x+12}{x^2-7x+12}$

4. _____

Perform the indicated operation. Write answers in lowest terms.

5. $\frac{x^2-2x-35}{x^2+10x+25} \cdot \frac{x^2+4x-5}{x^2-8x+7}$

5. _____

6. $\frac{16-x^2}{x^3+64} \cdot \frac{x^2}{x^2-2x-8} \div \frac{x^2+4}{x^2-4x+16}$

6. _____

7. $\frac{3x^2-6x-105}{x^2-3x-28} \div \frac{x+5}{4x+16}$

7. _____

8. $\frac{4}{x-3} - \frac{2}{x+1}$

8. _____

9. $\frac{3}{x^2+4x+4} - \frac{2}{x^2-4}$

9. _____

10. $2x-3 + \frac{3}{x-2}$

10. _____

11. $\frac{a+2}{2a} + \frac{1-a}{a^2}$

11. _____

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Chapter 6 Test Form C *cont'd*

Simplify each complex fraction.

12. $\frac{\frac{4x^2}{x^2-25}}{\frac{8x}{x-5}}$ 12. _____

13. $\frac{\frac{x-2}{3-3x}}{x-\frac{6}{3x}}$ 13. _____

14. $\frac{x-\frac{3}{x-2}}{1-\frac{1}{x-2}}$ 14. _____

Divide.

15. $\frac{30a^2b^3 + 45a^2b^2 - 20ab^2}{5ab^2}$ 15. _____

16. $(3x^3 + 7x^2 - x - 5) \div (3x + 1)$ 16. _____

17. Use synthetic division to divide.
 $(2x^4 - 7x^3 + 3x - 6) \div (x + 2)$ 17. _____

18. If $P(x) = 2x^3 - 3x + 5$, find $P(-2)$. 18. _____

Solve each equation for x .

19. $\frac{1}{x} + \frac{1}{x+1} = \frac{11}{30}$ 19. _____

20. $1 - \frac{2}{x} - \frac{15}{x^2} = 0$ 20. _____

21. $\frac{4}{x+4} - \frac{x}{x^2+x-12} = \frac{2}{x-3}$ 21. _____

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Chapter 6 Test Form C *cont'd*

22. $\frac{x-2}{a} = \frac{2x-3a}{4}$ 22. _____

23. Three workers can complete a job in 3 hours, 5 hours, and 6 hours respectively. How long will it take the workers to complete the job if they work together? 23. _____

24. One number is four times another. The sum of their reciprocals is $\frac{1}{4}$. Find the two numbers. 24. _____

25. Suppose that b is proportional to c , and inversely proportional to the square of d . If $b = 45$ when $c = 40$ and $d = 2$, find b when $c = 20$ and $d = 3$. 25. _____

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Chapter 6 Test Form D

Circle the correct answer.

1. Find the domain of the rational function $f(x) = \frac{x-4}{x^2-5x+6}$.

- a. $\{x|x \text{ is a real number and } x \neq 2, 3, 4\}$
- b. $\{x|x \text{ is a real number and } x \neq 2, 3\}$
- c. $\{x|x \text{ is a real number and } x \neq -1, 4, 6\}$
- d. $\{x|x \text{ is a real number and } x \neq -1, 6\}$

Write each rational expression in lowest terms.

2. $\frac{8x^2y^4}{12xy^5z^3}$

- a. $\frac{2}{3z^3}$
- b. $\frac{2x}{3yz^3}$
- c. $\frac{1}{4z^3}$
- d. $\frac{x}{4yz^3}$

3. $\frac{8(x-4)}{16-x^2}$

- a. $\frac{2}{x}$
- b. $-\frac{8}{x+4}$
- c. $-\frac{2}{x}$
- d. $\frac{8}{4+x}$

Perform the indicated operations. Write answers in lowest terms.

4. $\frac{4x^2y}{9xy} \div \frac{8x^3y^4}{3y} \cdot \frac{6x^2y^3}{8x}$

- a. $\frac{1}{8x}$
- b. $\frac{8}{x^5}$
- c. $\frac{8x^5y^6}{9}$
- d. x^5y^6

5. $\frac{x^2+x-20}{2} \cdot \frac{10x}{x^2+5x}$

- a. $5(x-4)$
- b. $-5(x+4)$
- c. $5x(x-4)$
- d. $x-20$

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Chapter 6 Test Form D *cont'd*

6. $\frac{3x-6}{x^2-9x+20} \div \frac{x^2+x-6}{x^2+7x+12}$

a. $\frac{3(x-2)^2}{(x-5)(x+4)^2}$ b. $\frac{3(x-3)}{(x-5)(x+3)}$ c. $\frac{3(x+4)}{(x-5)(x-4)}$ d. $\frac{3}{x+4}$

7. $\frac{x^2+xy-3x-3y}{2x^2-2x-12} \cdot \frac{x^2-3x-2xy+6y}{x^2-xy-2y^2}$

a. $\frac{x-3}{2(x+2)}$ b. $\frac{-3(x+y)}{2x+4}$ c. $-\frac{3}{2}$ d. $\frac{y(x-3)}{2x(x-1)}$

8. $\frac{3(2-x^2)}{x^2+5x+6} + \frac{3x-12}{x+3}$

a. $\frac{6}{x}$ b. $\frac{18}{x+3}$ c. $-\frac{3}{x}$ d. $-\frac{6}{x+2}$

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

a. $\frac{3x+4}{(x-4)(x+4)}$ b. $\frac{5}{x+4}$ c. $\frac{5}{x-4}$ d. $\frac{-3x-4}{(x+4)(x-4)}$

10. $2x+6 - \frac{1}{x+3}$

a. $\frac{2x^2-6x+1}{x+3}$ b. $\frac{2x^2+12x-1}{x+3}$ c. $\frac{2x^2-12x+19}{x+3}$ d. $\frac{2x^2+12x+17}{x+3}$

11. $\frac{3}{x^2+2x-24} + \frac{x}{x^2+3x-18}$

a. $\frac{x+3}{(x-4)(x+6)(x-3)}$ b. $\frac{1}{(x-4)(x+6)}$
c. $\frac{x^2-x-9}{(x-4)(x+6)(x-3)}$ d. $\frac{-9}{(x-4)(x+6)(x-3)}$

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Chapter 6 Test Form D *cont'd*

12. $\frac{12x^3y - 16xy^2 + 8}{4x^2y^2}$

a. $\frac{3x}{y} - \frac{4}{x} + \frac{2}{x^2y^2}$

b. $3y - 4x + 2$

c. $12xy - 16x + 2$

d. $3x - 4y + 8$

13. $(6x^3 + x^2 - 4x + 2) \div (2x - 1)$

a. $3x^2 - x - \frac{3}{2} + \frac{7}{2x+1}$

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

c. $4x^2 - 4x - 2$

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

14. Use synthetic division to divide. $2x^4 + x^3 - 6x^2 + 1$ by $x + 2$.

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

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

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

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

15. Use the remainder theorem to find $P(-2)$ for $P(x) = 3x^4 - 2x^3 + 5x^2 - 7x + 8$.

a. 46

b. 106

c. -28

d. 38

Simplify each complex fraction.

16. $\frac{\frac{x+4}{7}}{x-4}$

a. $14(x^2 - 16)$

b. $\frac{x+4}{7}$

c. $\frac{x+4}{14}$

d. $\frac{x^2 - 16}{7x}$

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

- a. $\frac{x+2}{3-x}$ b. $\frac{x+2}{x-3}$ c. $\frac{x-3}{x+2}$ d. $\frac{3-x}{x+2}$

18. $\frac{\frac{2}{x^2}}{\frac{4}{x}}$

- a. $\frac{8}{x^3}$ b. $\frac{x}{2}$ c. $\frac{1}{2x}$ d. $2x$

Solve each equation for x .

19. $\frac{2x+4}{x-2} = \frac{2}{5}$

- a. -3 b. -2 c. -6 d. 2

20. $5 + \frac{15}{x} = 10$

- a. -3, 3 b. 3 c. 1 d. 5

21. $\frac{2}{x+3} - \frac{1}{x^2-9} = \frac{1}{x-3}$

- a. 10 b. -2, 3 c. 6 d. 12

22. $\frac{2}{x+2} + \frac{x^2}{x^2-4} = \frac{1}{x-2}$

- a. -3, 2 b. -3 c. -2, 3 d. 3

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Chapter 6 Test Form D *cont'd*

23. Solve for a . $\frac{2a+b}{6} = \frac{3a-b}{5}$

a. $a = 11b - 8$ b. $a = 3b$ c. $a = \frac{11b+3}{8}$ d. $a = \frac{11b}{8}$

24. Suppose that Q is jointly proportional to R and S . If $Q = 10$ when $R = 6$ and $S = 5$, find Q when $R = 9$ and $S = 11$.

a. 66 b. 99 c. 33 d. $\frac{1}{3}$

25. The sum of the reciprocals of two consecutive integers is $\frac{25}{156}$. Find the integers.

a. 12, 14 b. 12, 13 c. 16, 17 d. 13, 14

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Chapter 6 Test Form E

Circle the correct answer.

1. Find all numbers for which the rational expressions $\frac{4-x}{2x^3-14x^2+12x}$ is undefined.

- a. $x = 1, 2, 3, 6$ b. $x = 0, 1, 6$ c. $x = 0, 1, 4, 6$ d. $x = 4$

2. Solve $x = \frac{2y+6}{y}$ for y .

- a. $y = \frac{3}{x}$ b. $y = -\frac{3}{x}$ c. $y = \frac{6}{x-2}$ d. $y = \frac{2y+6}{x}$

Write each rational expression in lowest terms.

3. $-\frac{24x^2y^3z}{18x^3yz^4}$

- a. $-\frac{3xy^2z^3}{4}$ b. $\frac{3xz^3}{4y^2}$ c. $-\frac{4y^2}{3xz^3}$ d. $-\frac{12x^5y^4z^5}{9}$

4. $\frac{x-2}{x^4-16}$

- a. $\frac{1}{x^3-8}$ b. $\frac{1}{(x+2)(x^2+4)}$ c. $\frac{1}{x^3+8}$ d. x^3+8

Perform the indicated operations. Write answers in lowest terms.

5. $\frac{3x^2y}{5xy} \div \frac{9xy^4}{15xy^3}$

- a. $\frac{x}{y}$ b. xy c. $\frac{9xy}{25}$ d. $\frac{y}{x}$

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6. $\frac{2x^3 + 8x^2 - 24x}{x^2 + xy + 6x + 6y} \cdot \frac{x^2 - y^2}{2x^3y - 8x^2y + 8xy}$

a. $\frac{y}{2}$ b. $\frac{1}{x-2}$ c. $\frac{1}{2}$ d. $\frac{x-y}{y(x-2)}$

7. $\frac{x^2 - 4}{3x + 27} \div \frac{x - 2}{6x^2 + 48x - 54}$

a. $\frac{2(x-1)}{x+2}$ b. $\frac{2(x+2)}{x-1}$ c. $2(x-2)(x-1)$ d. $2(x+2)(x-1)$

8. $\frac{3}{x-9} + \frac{x-3}{9-x}$

a. $\frac{6-x}{x-9}$ b. $\frac{3+x}{3x}$ c. $-\frac{1}{9}$ d. $\frac{x}{x-9}$

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

a. $\frac{2x^2 + 12x + 18}{x^2 - 9}$ b. $\frac{2x^2 - 2x + 18}{x^2 - 9}$ c. $\frac{12x - 6}{x^2 - 9}$ d. $\frac{2x^2 + 5x - 6}{x^2 - 9}$

10. $\frac{2}{x^2 + 2x - 15} + \frac{x}{x^2 - x - 30}$

a. $\frac{x+2}{2x^2 + x - 45}$ b. $\frac{x^2 - x - 12}{(x+5)(x-6)(x-3)}$
c. $\frac{x+4}{(x+5)(x-6)}$ d. $\frac{x+2}{(x+5)(x-6)(x-3)}$

11. $2x - 3 - \frac{4}{x+2}$

a. $\frac{2x-7}{x+2}$ b. $\frac{2x^2 + x - 10}{x+2}$ c. $\frac{2x+1}{x+2}$ d. $\frac{2x^2 - 3x - 10}{x+2}$

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Chapter 6 Test Form E *cont'd*

Simplify each complex fraction.

12. $\frac{\frac{2}{x^4}}{\frac{4}{x^2}}$

- a. $\frac{8}{x^6}$ b. $\frac{2}{x^2}$ c. $\frac{1}{2x^2}$ d. $2x^2$

13. $\frac{\frac{x^2-6x+9}{x^3+27}}{\frac{x^2-9}{x+3}}$

- a. $\frac{1}{(x+3)(x-3)}$ b. $\frac{x-3}{(x+3)(x^2-3x+9)}$ c. -6 d. $\frac{-1}{x^2-3x+9}$

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

- a. $\frac{2x+3}{5x+3}$ b. $\frac{2x+3}{5x+7}$ c. $\frac{2x+1}{5x+3}$ d. $\frac{2x+3}{5x-7}$

Divide.

15. $\frac{4x^2y-8x^2y^2+12xy}{4xy}$

- a. $2x^4y^3$ b. $x-8x^2y^2+12xy$ c. $x+4x^3y^2$ d. $x-2xy+3$

16. $\frac{2x^3-x^2+4x+3}{x-3}$

- a. $2x^2+5x+19+\frac{60}{x-3}$ b. $2x^2-3x+11+\frac{38}{x-3}$
c. $2x^2+5x-1+\frac{1}{x-3}$ d. $2x^2+5x+15x+\frac{64}{x-3}$

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Chapter 6 Test Form E *cont'd*

17. Use synthetic division to divide $3x^4 + 2x^3 - 9x^2 + x + 2$ by $x - 2$.

a. $3x^3 - 8x^2 + 7x + 15 + \frac{32}{x-2}$

b. $3x^3 + 8x^2 + 7x - 4 + \frac{12}{x-2}$

c. $3x^3 + 8x^2 + 7x + 15 + \frac{32}{x-2}$

d. $3x^3 + 8x^2 + 7x + 15 - \frac{20}{x-2}$

18. If $P(x) = 3x^4 + 2x^3 - 9x^2 + x + 2$ use the remainder theorem to find $P(-2)$.

a. 28

b. -8

c. -4

d. -2

Solve each equation for x .

19. $\frac{4}{x} + \frac{1}{5} = \frac{6}{x}$

a. 4

b. 10

c. 5

d. 2

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

a. -1

b. -2

c. 3

d. -4

21. $\frac{2}{x+3} - \frac{x}{x^2-9} = \frac{4}{x-3}$

a. -6

b. -8

c. -3, 3

d. -2

22. $0 = x + 9 + \frac{14}{x}$

a. 2, 7

b. -2, 7

c. -7, 2

d. -7, -2

23. Solve for a . $\frac{x+2}{a} = \frac{3x-2}{6}$

a. $a = 3x + 14$

b. $a = \frac{6x+12}{3x+2}$

c. $a = \frac{6x+12}{3x-2}$

d. $a = 6x$

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Chapter 6 Test Form E *cont'd*

- 24.** A plane flies 1725 miles with the wind and 1395 miles against the wind in the same amount of time. If the speed of the plane in still air is 520 mph, find the speed of the wind.
- a.** 45 mph **b.** 65 mph **c.** 55 mph **d.** 60 mph
- 25.** Suppose that B is proportional to C and inversely proportional to D . If $B = 15$ when $C = 60$ and $D = 2$, find B when $C = 40$ and $D = 4$.
- a.** 5 **b.** 20 **c.** 10 **d.** 25

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Chapter 6 Test Form F

Circle the correct answer.

Write each rational expression in lowest terms.

1. $\frac{4x^2 - 10x - 6}{2x^2 + 5x + 2}$

a. $\frac{2x+1}{x+2}$

b. -3

c. $\frac{2(x-3)}{2x+1}$

d. $\frac{2(x-3)}{x+2}$

2. $\frac{x^2 + xy - 4x - 4y}{x^2 - 3xy - 4y^2}$

a. $\frac{1}{y}$

b. $\frac{4x}{7}$

c. $\frac{x-4}{x-4y}$

d. $-\frac{1}{y}$

Find the domain of the rational function.

3. $f(x) = \frac{x+2}{x^2+8x-9}$

a. $\{x|x \text{ is a real number and } x \neq -9, -1, 0\}$

b. $\{x|x \text{ is a real number and } x \neq -9, 1\}$

c. $\{x|x \text{ is a real number and } x \neq -1, 0, 9\}$

d. $\{x|x \text{ is a real number and } x \neq -1, 9\}$

4. Solve for c . $a = \frac{a-c}{c+d}$

a. $c = \frac{a-d}{a}$

b. $c = -ad$

c. $c = -d$

d. $c = \frac{a-ad}{a+1}$

Perform the indicated operations. Write answers in lowest terms.

5. $\frac{6x-18}{5} \div \frac{3x^2-27}{2}$

a. $\frac{12}{5(x-3)}$

b. $\frac{4}{5(x+3)}$

c. $\frac{4}{5x+3}$

d. $\frac{4}{15(x+3)}$

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Chapter 6 Test Form F *cont'd*

6. $\frac{9x^3y+18x^2y}{3xy} \cdot \frac{2x^2-2x}{12x^4-24x^3+12x^2}$

a. $\frac{x+2}{2(x-1)}$ b. -1 c. -2 d. $\frac{x-2}{x+1}$

7. $\frac{2x+10}{x-3} \div \frac{x^2+x-20}{3x^2-12x+9}$

a. $\frac{6(x+5)}{x-1}$ b. $\frac{6(x-1)}{x-4}$ c. $\frac{2(x-1)}{3(x-4)}$ d. $\frac{x-4}{6(x-1)}$

8. $\frac{2x}{x-4} - \frac{3}{x+6}$

a. $\frac{2x^2+9x+12}{(x-4)(x+6)}$ b. $\frac{2x^2+15x+12}{(x-4)(x+6)}$ c. $\frac{2x^2+15x-12}{(x-4)(x+6)}$ d. $\frac{2x^2-15x+12}{(x-4)(x+6)}$

9. $\frac{5}{x^2+2x+4} - \frac{2}{x^3-8}$

a. $\frac{x^2+2x}{x^3-8}$ b. $\frac{x^2-x-2}{(x+2)^2(x-1)}$ c. $\frac{5x-12}{x^3-8}$ d. $\frac{5x-8}{x^3-8}$

Divide.

10. $\frac{20a^3b^3-10a^2b^2-5ab}{5ab}$

a. $4a^2b^2-2ab-1$ b. $4a^3b^2-2ab$ c. $\frac{1}{ab}$ d. $20a^3b^3-10a^2b^2-1$

11. $\frac{2x^4-7x^3+x+2}{x-5}$

a. $2x^3-x^2+13x+34+\frac{202}{x-5}$ b. $x^3+3x^2+20x+50+\frac{300}{x-5}$
c. $3x^3+3x^2-15x-24-\frac{10}{x-5}$ d. $2x^3+3x^2+15x+76+\frac{382}{x-5}$

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12. Use synthetic division to divide $x^4 - 12x^2 + 4x - 7$ by $x + 3$.

a. $x^3 - 3x^2 + 3x + 13 + \frac{52}{x+3}$

b. $x^3 - 3x^2 - 3x + 13 - \frac{46}{x+3}$

c. $x^3 - 3x^2 + 3x + 13 + \frac{52}{x+3}$

d. $x^3 - 3x^2 - 3x + 13 + \frac{32}{x+3}$

13. If $P(x) = 32x^6 + 8x^4 - 8x^3 + 3$, use the remainder theorem to find $P\left(-\frac{1}{2}\right)$.

a. -5

b. 5

c. 3

d. 2

Simplify each complex fraction.

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

a. $\frac{14}{2-3x}$

b. $\frac{10}{2-3x}$

c. $\frac{2x+3}{2-3x}$

d. $\frac{8x+6}{2-3x}$

15. $\frac{3 - \frac{2}{5}}{4 + \frac{1}{4}}$

a. $\frac{52}{85}$

b. $\frac{68}{75}$

c. $\frac{68}{85}$

d. $\frac{52}{75}$

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

a. $\frac{x-3}{3x+2}$

b. $\frac{x-3}{3x-11}$

c. $\frac{x-3}{2x+3}$

d. $\frac{x-3}{3x-7}$

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$$17. \frac{\frac{1}{x-2} - \frac{2}{2-x}}{\frac{3}{x-2} + \frac{2}{x}}$$

- a. $\frac{3x}{2x-4}$ b. $\frac{3x}{5x-4}$ c. $\frac{x-3}{2x+3}$ d. $\frac{x-3}{3x-7}$

$$18. \text{Add: } 2x+1 + \frac{3}{3x-4}$$

- a. $\frac{6x^2+5x+1}{3x-4}$ b. $\frac{6x^2+5x-1}{3x-4}$ c. $\frac{6x^2-5x-1}{3x-4}$ d. $\frac{6x^2-5x+2}{3x-4}$

Solve each equation for x .

$$19. 5 - \frac{4}{x} = \frac{12}{x^2}$$

- a. $-2, \frac{6}{5}$ b. $-\frac{6}{5}, 2$ c. $-\frac{5}{6}, 2$ d. $-\frac{6}{5}, 0, 2$

$$20. \frac{2}{x-1} + \frac{3x}{x^2+5x-6} = \frac{4}{x+6}$$

- a. -16 b. -12 c. 8 d. $-6, 4$

$$21. \frac{1}{x+1} + \frac{3}{x+2} = \frac{11}{24}$$

- a. $-7, \frac{14}{11}$ b. $-\frac{14}{11}, 7$ c. 7 d. $8, 9$

$$22. \frac{3}{x-3} = \frac{2}{x-3} + \frac{x}{18}$$

- a. $-3, 6$ b. 6 c. $-3, 9$ d. -9

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- 23.** One number is 5 times another. The sum of their reciprocals is the fraction $\frac{1}{5}$. Find the two numbers.
- a.** 5, 6 **b.** 6, 30 **c.** $\frac{1}{30}, \frac{1}{6}$ **d.** 1, 4
- 24.** Two trains leave at the same time going in opposite directions. One train travels 25 mph faster than the other. Five hours later, the trains are 675 miles apart. Find the speed of each.
- a.** 50 mph, 75 mph **b.** 45 mph, 70 mph
c. 55 mph, 80 mph **d.** 65 mph, 90 mph
- 25.** Suppose B is proportional to the square of C and inversely proportional to D . If $B = 27$ when $C = 6$ and $D = 16$, find B when $C = 3$ and $D = 36$.
- a.** 18 **b.** 3 **c.** 24 **d.** 16