Name ______________________ Date ___________ Class ___________

LESSON 8-2

Practice B

Multiplying and Dividing Rational Expressions

Simplify. Identify any *x*-values for which the expression is undefined.

1. $\dfrac{x^2 + 3x + 2}{x^2 - 3x - 4}$

2. $\dfrac{4x^6}{2x^4}$

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

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4. $\dfrac{x^3 + x^2 - 20x}{x^2 - 16}$

5. $\dfrac{3x^2 - 9x - 12}{6x^2 + 9x + 3}$

6. $\dfrac{9 - 3x}{15 - 2x - x^2}$

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Multiply. Assume all expressions are defined.

7. $\dfrac{4x + 16}{2x + 6} \cdot \dfrac{x^2 + 2x - 3}{x + 4}$

8. $\dfrac{x + 3}{x - 1} \cdot \dfrac{x^2 - 2x + 1}{x^2 + 5x + 6}$

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Divide. Assume all expressions are defined.

9. $\dfrac{5x^6}{x^2y} \div \dfrac{10x^2}{y}$

10. $\dfrac{x^2 - 2x - 8}{x^2 - 2x - 15} \div \dfrac{2x^2 - 8x}{2x^2 - 10x}$

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Solve. Check your solution.

11. $\dfrac{x^2 + x - 12}{x - 3} = 15$

12. $\dfrac{2x^2 + 8x - 10}{2x^2 + 14x + 20} = 4$

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Solve.

13. The distance, d, traveled by a car undergoing constant acceleration, a, for a time, t, is given by $d = v_0 t + \frac{1}{2}at^2$, where v_0 is the initial velocity of the car. Two cars are side by side with the same initial velocity. One car accelerates, $a = A$, and the other car does not accelerate, $a = 0$. Write an expression for the ratio of the distance traveled by the accelerating car to the distance traveled by the nonaccelerating car as a function of time.

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LESSON 8-2

Practice A

Multiplying and Dividing Rational Expressions

Answer each question.

1. What could make a rational expression undefined?
   Possible answer: If the denominator is 0, then the expression is undefined because division by 0 is impossible.

2. What value of x gives a denominator equal to 0 for the expression $\frac{x+4}{x-3}$? **$x = 3$**

Simplify. Identify any x-values for which the expression is undefined.

3. $\frac{5x}{x^3}$ — $\frac{5}{x^2}$; $x \neq 0$

4. $\frac{x^2+3x}{x^3}$ — $\frac{x+3}{x^2}$; $x \neq 0$

5. $\frac{4x+12}{6x+18}$ — $\frac{2}{3}$; $x \neq -3$

6. $\frac{2x+7}{x+3}$ — $\frac{2x+7}{x+3}$; $x \neq -3$

Complete. Assume that all expressions are defined.

7. $\frac{3x}{2y} \cdot \frac{2}{y} = \frac{3x}{y^2}$

8. $\frac{2x^5}{9y^4} \cdot \frac{3y^2}{x} = \frac{2x^4}{3y^2}$

9. $\frac{x+2}{x-1} \cdot \frac{4x-4}{(x+2)(x-2)} = \frac{4}{x-2}$

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

11. $\frac{2x}{3y} \div \frac{2x^2}{3y^2} = \frac{2x}{3y} \cdot \frac{3y^2}{2x^2} = \frac{y}{x}$

12. $\frac{x+1}{x-2} \div \frac{5(x+1)}{2(x+2)} = \frac{x+1}{x-2} \cdot \frac{2(x+2)}{5(x+1)} = \frac{2x+4}{5x-10}$

13. $\frac{2y}{x+4} \div \frac{4y^2}{x+4} = \frac{2y}{x+4} \cdot \frac{x+4}{4y^2} = \frac{1}{2y}$

Solve.

14. $\frac{2x^2+2x}{x+1} = 8$ — $x = 4$

15. $\frac{9x+9}{x^3+x^2} = 1$ — $x = 3$

16. $\frac{5x^2+15x}{x+3} = 10$ — $x = 2$

17. $\frac{x^2+3x+2}{2x^2+4} = 1$ — $x = 1$

LESSON 8-2

Practice B

Multiplying and Dividing Rational Expressions

Simplify. Identify any x-values for which the expression is undefined.

1. $\frac{x^2+3x+2}{x^2-3x-4}$ — $\frac{x+2}{x-4}$; $x \neq -1$, $x \neq 4$

2. $\frac{4x^6}{2x^4}$ — $2x^2$; $x \neq 0$

3. $\frac{x^2-x^3}{2x^2-5x+3}$ — $\frac{-x^2}{2x-3}$; $x \neq 1$, $x \neq \frac{3}{2}$

4. $\frac{x^3+x^2-20x}{x^2-16}$ — $\frac{x^2+5x}{x+4}$; $x \neq 4$, $x \neq -4$

5. $\frac{3x^2-9x-12}{6x^2+9x+3}$ — $\frac{x-4}{2x+1}$; $x \neq -1$, $x \neq -\frac{1}{2}$

6. $\frac{9-3x}{15-2x-x^2}$ — $\frac{3}{x+5}$; $x \neq 3$, $x \neq -5$

Multiply. Assume all expressions are defined.

7. $\frac{4x+16}{2x+6} \cdot \frac{x^2+2x-3}{x+4}$ — $2x - 2$

8. $\frac{x+3}{x-1} \cdot \frac{x^2-2x+1}{x^2+5x+6}$ — $\frac{x-1}{x+2}$

Divide. Assume all expressions are defined.

9. $\frac{5x^6}{x^2y} \div \frac{10x^2}{y}$ — $\frac{x^2}{2}$

10. $\frac{x^2-2x-8}{x^2-2x-15} \div \frac{2x^2-8x}{2x^2-10x}$ — $\frac{x+2}{x+3}$

Solve. Check your solution.

11. $\frac{x^2+x-12}{x-3} = 15$ — $x = 11$

12. $\frac{2x^2+8x-10}{2x^2+14x+20} = 4$ — $x = -3$

Solve.

13. The distance, d, traveled by a car undergoing constant acceleration, a, for a time, t, is given by $d = v_0 t + \frac{1}{2}at^2$, where v_0 is the initial velocity of the car. Two cars are side by side with the same initial velocity. One car accelerates, $a = A$, and the other car does not accelerate, $a = 0$. Write an expression for the ratio of the distance traveled by the accelerating car to the distance traveled by the nonaccelerating car as a function of time.
    $1 + \frac{At}{2v_0}$

LESSON 8-2

Practice C

Multiplying and Dividing Rational Expressions

Multiply. Assume all expressions are defined.

1. $\frac{2x^3y^6}{5x^2y^3} \cdot \frac{15x^2y^2}{10x^4y}$ — $\frac{3y^4}{5x}$

2. $\frac{2x+14}{x^2-25} \cdot \frac{8x+40}{6x+42}$ — $\frac{8}{3(x-5)}$

3. $\frac{4x^3+12x^2}{2x^3-16x^2} \cdot \frac{2x^2-10x-48}{x+3}$ — $4(x+3)$

4. $\frac{3x^2+15x-18}{36x^3-12x^2} \cdot \frac{9x^3-3x^2}{9x^2+36x-108}$ — $\frac{x-1}{12(x-2)}$

Divide. Assume all expressions are defined.

5. $\frac{4x^3y^2}{2x^6y} \div \frac{xy+2y}{x^2-3x-10}$ — $\frac{2(x-5)}{x^3}$

6. $\frac{3x^2+6x-24}{x^2-x-20} \div \frac{3x^3-9x^2+6x}{x}$ — $\frac{1}{(x-5)(x-1)}$

7. $\frac{4x^3y^{12}}{y^5x^2} \div \frac{6y^7m^3x^3}{3m^3y}$ — $\frac{2y}{x^2}$

8. $\frac{4x^2-12x-72}{8x^2+32x-40} \div \frac{x^2-9x+18}{x^2+2x-15}$ — $\frac{x+3}{2(x-1)}$

Solve. Check your solution.

9. $\frac{4x^2-4x-168}{2x+12} = 20$ — $x = 17$

10. $\frac{x^2-3x-18}{x+3} = 13$ — $x = 19$

11. $\frac{x^2+3x-10}{x-2} = 7$ — No solution

12. $\frac{2x^2-18x+40}{2x-10} = 5$ — $x = 9$

Solve.

13. The formula for the volume of a cylinder is $\pi r^2 h$ and the formula for its surface area is $2\pi r^2 + 2\pi rh$, where r is the radius and h is the height. A cylindrical industrial storage tank has a surface area to-volume ratio of 3. If the height of the cylindrical tank is 2 meters, what is the radius?
    1 meter

LESSON 8-2

Review for Mastery

Multiplying and Dividing Rational Expressions

Examples of rational expressions: $\frac{3}{x}$, $\frac{x+1}{x+2}$, and $\frac{x+3}{2x^2}$

Undefined at $x = 0$

Undefined at $x = -2$

Undefined at $x = 0$

When simplifying a **rational expression**:

- Factor the numerator and the denominator completely.
- Divide out any common factors.
- Identify any x-values for which the expression is undefined.

Simplify: $\frac{24x^6}{8x^2}$.

$x \neq 0$, because $8x^2$ is undefined at $x = 0$.

$\frac{24x^6}{8x^2} = \frac{\cancel{8} \cdot 3}{\cancel{8}} x^{6-2} = 3x^4$

Use the Quotient of Powers Property.

Simplify: $\frac{x^2-2x-8}{x^2+x-2}$.

First, factor the numerator and the denominator.

$\frac{x^2-2x-8}{x^2+x-2} = \frac{(x-4)(x+2)}{(x+2)(x-1)} = \frac{(x-4)\cancel{(x+2)}}{\cancel{(x+2)}(x-1)} = \frac{(x-4)}{(x-1)} = \frac{x-4}{x-1}$

$x \neq -2$ and $x \neq 1$

Divide out common factors.

Simplify.

1. $\frac{x^2-2x-3}{x^2+6x+5}$ — $\frac{(x+1)(x-3)}{(x+1)(x+5)}$ — $\frac{x-3}{x+5}$, $x \neq$ $-1, -5$

2. $\frac{20x^9}{4x^3}$ — $\frac{20}{4} \cdot \frac{x^9}{x^3}$ — $5x^6$, $x \neq$ 0

3. $\frac{x^2-4x}{x^2-5x+4}$ — $\frac{x\cancel{(x-4)}}{\cancel{(x-4)}(x-1)}$ — $\frac{x}{x-1}$, $x \neq$ $1, 4$