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Reteaching

Simplifying Rational Expressions

Rational expressions may be in the form of *monomials* or *polynomials*.

Simplifying rational expressions is similar to simplifying numerical fractions where common factors are taken out.

$$\text{Example: } \frac{x-2}{3x-6} = \frac{x-2}{3(x-2)} = \frac{1}{3}$$

Excluded values are those that make the denominator 0. A denominator can not equal 0, so these values are not part of the solution. Consider not only the solution, but also the original expression to figure out the excluded values.

Problem

What is the simplified form of $\frac{2a^3}{4a^2}$? State any excluded values.

Solve Monomials: reduce numbers; cancel out like variables

$$\frac{2a^3}{4a^2} = \frac{2 \cdot a \cdot a \cdot a}{2 \cdot 2 \cdot a \cdot a} = \frac{a}{2}$$

The simplified form is $\frac{a}{2}$ when $a \neq 0$.

What is the simplified form of $\frac{x^2 + 4x + 4}{x + 2}$? State any excluded values.

Solve Polynomials: cancel out factors or groups of factors

$$\frac{x^2 + 4x + 4}{x + 2} = \frac{(x + 2)(x + 2)}{x + 2} = x + 2$$

The simplified form is $x + 2$ when $x \neq -2$.

Recognizing Opposite Factors

You can find the opposite of a number by multiplying by -1 . For example, the opposite of 3 is $(-1)(3) = -3$.

Similarly, multiplying a polynomial by -1 results in its opposite. For example, the opposite of $x - 2$ is $(-1)(x - 2) = -x + 2$. It can also be written as $2 - x$.

Problem

Write the opposite of $(20 - x)$ two ways.

Solve Multiply by (-1) to find the opposite.

$$(-1)(20 - x) = -20 + x \text{ or } x - 20$$

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Reteaching (continued)

Simplifying Rational Expressions

Exercises

Simplify each expression. State any excluded values.

1. $\frac{a^4}{a}$ $a^3, a \neq 0$

2. $\frac{4x^3}{16x^2}$ $\frac{x}{4}; x \neq 0$

3. $\frac{cd^2}{3c^2d}$ $\frac{d}{3c}; d \neq 0, c \neq 0$

4. $\frac{lm}{l^2m^2n}$

5. $\frac{64y}{16y^2x}$ $\frac{4}{xy}; x \neq 0, y \neq 0$

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

$\frac{1}{lmn}; l \neq 0, m \neq 0, n \neq 0$

7. $\frac{5x^3 - 15x^2}{x - 3}$ $5x^2; x \neq 3$

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

9. $\frac{2b + 4}{4}$ $\frac{b + 2}{2}$

10. $\frac{3a + 15}{15}$ $\frac{a + 5}{5}$

11. $\frac{3p - 21}{18}$ $\frac{p - 7}{6}$

12. $\frac{4}{4y - 8}$ $\frac{1}{y - 2}; y \neq 2$

13. $\frac{7z - 28}{14z}$ $\frac{z - 4}{2z}; z \neq 0$

14. $\frac{9}{18 - 81a}$ $\frac{1}{2 - 9a}; a \neq \frac{2}{9}$

15. $\frac{5}{35 - 5c}$ $\frac{1}{7 - c}; c \neq 7$

16. $\frac{2q + 2}{q^2 + 4q + 3}$ $\frac{2}{q + 3}; q \neq -3 \text{ or } -1$

17. $\frac{a + 2}{a^2 + 4a + 4}$ $\frac{1}{a + 2}; a \neq -2$

18. $\frac{2x - 2}{2 - 2x}$ $-1; x \neq 1$

19. $\frac{9 - x^2}{x - 3}$ $-x - 3, x \neq 3$

20. $\frac{2a + 4}{2}$ $a + 2$

Write the opposite expression and simplify the opposite expression.

21. $\frac{10b^5}{40b^4}$ $-\frac{10b^5}{40b^4}; -\frac{b}{4}, b \neq 0$

22. $\frac{36 - z^2}{4z - 24}$ $\frac{z^2 - 36}{4z - 24}; \frac{z + 6}{4}, z \neq 6$

23. $\frac{x^2 - 16}{x - 4}$ $-\frac{x^2 + 16}{x - 4}; -x - 4, x \neq 4$

24. $\frac{30 + 2z}{14 + 4z}$ $-\frac{(30 + 2z)}{14 + 4z}; -\frac{15 - z}{7 + 2z}, z \neq 3.5$