

RATIONAL EXPRESSIONS

Study Materials: Key Concepts, Practice Questions, Answers

Mathema
Contest

Rational Expressions -Study guide and Practice Questions



Name: _____

Definitions:

- 1. Rational Expression:** A fraction where the numerator and/or the denominator are polynomials.
- 2. Simplifying Rational Expressions:** Reducing the expression to its simplest form by factoring and canceling common factors in the numerator and denominator.
- 3. Multiplying Rational Expressions:** Multiply the numerators together and the denominators together, then simplify.
- 4. Dividing Rational Expressions:** Multiply by the reciprocal of the divisor, then simplify.
- 5. Adding/Subtracting Rational Expressions:** Find a common denominator, rewrite each expression with this common denominator, combine the numerators, then simplify.

Key Concepts:

- 1. Factoring:** Break down polynomials into products of their factors.
- 2. Common Denominator:** A shared multiple of the denominators of two or more fractions.
- 3. Reciprocal:** The reciprocal of a fraction

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- 4. Domain Restrictions:** Values that make the denominator zero are excluded from the domain.

Practice Questions:

- 1. Simplify:**

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$$6x^2 \cdot 3x \cdot 6x^2 \cdot 3x$$

○ Answer: :

$$6x^2 \cdot 3x = 6x \cdot x \cdot 3x = 2x \cdot 6x^2 \cdot 3x = 6x \cdot x \cdot 3x = 2x$$

2. Simplify:

$$x^2 - 9x^2 - 3x \cdot x^2 - 9x^2 - 3x$$

○ Answer:

$$(x - 3)(x + 3)x(x - 3) = (x + 3)x(x - 3)(x + 3)x(x - 3) = (x + 3)x$$

3. Multiply:

$$3x^4 \cdot 8x^2 \cdot 3x^4 \cdot 8x^2$$

○ Answer:

$$3x \cdot 84x^2 = 24x^4 \cdot x^2 = 6x \cdot 3x \cdot 84x^2 = 24x^4 \cdot x^2 = 6x$$

4. Divide:

$$5x^6 \cdot 5x^6$$

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$$10x^{10}x$$

○ Answer:

$$5x^6 \cdot x^{10} = 5x^{26} = x^{21} 5x^6 \cdot x^{10} = 5x^{26} = x^{21} 2$$

5. Add:

$$3x + 2x \quad 3x + 2x$$

○ Answer:

$$3x + 2x = 3x + 2x =$$

$$3 + 2x \quad 3 + 2x$$

=

$$5x \quad 5x$$

6. Subtract:

$$5x + 2 - 1x + 2 \quad 5x + 2 - 1x + 2$$

○ Answer:

$$5x + 2 - 1x + 2 = 5 - 1x + 2 = 4x + 2 \quad 5x + 2 - 1x + 2 = 5 - 1x + 2 = 4x + 2$$

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7. Simplify:

$$\frac{x^2-4}{x^2-2x-8} \cdot \frac{x^2-4}{x^2-2x-8}$$

○ Answer:

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

8. Multiply:

$$\frac{x^2-4}{x^2-4} \cdot \frac{4x-8}{x^2-4} \cdot \frac{4x-8}{x^2-4}$$

○ Answer:

$$\frac{x^2-4}{x^2-4} \cdot \frac{4(x-2)}{x^2-4} \cdot \frac{4(x-2)}{x^2-4}$$

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

9. Divide:

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

○ Answer:

$$\frac{3x(x-3)(x+3)}{x+3} \div \frac{3x(x-3)(x+3)}{x+3} =$$

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$$3x(x+3)(x-3)(x+3) \cdot 2 = 3x^2(x-3)3x(x+3)x-3x+3 \cdot 2 = 3x^2(x-3)$$

10. Add:

$$2xx-1+3x+12xx-1+3x+1$$

○ Answer:

$$2x(x+1)+3(x-1)(x-1)(x+1)2xx+1+3(x-1)(x-1)(x+1)$$

=

$$2x^2+2x+3x-3x^2-1=2x^2+5x-3x^2-12x^2+2x+3x-3x^2-1=2x^2+5x-3x^2-1$$