

8.4 Rational Expressions

Objective:

- SW simplify rational expressions and multiply and divide rational expressions.

Warmup

Simplify the problems below – it's been a while, but who knows, you might surprise yourself.

1) $\frac{4x^2y^3}{18xy^8}$

2) $\frac{5a^2b^3}{12ab^5} \cdot \frac{36a^7b}{25a^2b^4}$

What is a Rational Expression? _____

Monomials

I. Monomial Simplification

1. $\frac{15a^2b^3}{9a^7}$

2. $\frac{2x^2y^7z^5}{5x^5y^2z}$

II. Multiplying Monomials

3. $\frac{15a^3b^2}{5a^2} \cdot \frac{20a^4b^4}{3b^2}$

4. $\frac{20x^7y}{2xy^3} \cdot \frac{12x^8y^5}{10y^2}$

III. *Dividing Monomials*

First you must flip the second fraction and change the division symbol into multiplication.

Then you can reduce top to bottom OR diagonally.

$$5. \quad \frac{2x^2y^3}{16a^4b^7} \div \frac{15x^2y^{10}}{25ab^{11}}$$

$$6. \quad \frac{4x^2}{5b^2} \div \frac{12x^3}{b^5}$$

Polynomials

When you are simplifying rational expressions with binomials, trinomials, etc., you cannot separate them.

They are stuck together by a plus or minus sign. They are bffs ☺...Like Peanut Butter and Jelly. Like Nutella and well anything really.

$$\text{INCORRECT :} \quad \frac{x + 4}{x - 6}$$

$$\text{CORRECT:} \quad \frac{y-3}{y-3}$$

$$\frac{2(x+4)}{6}$$

$$\frac{5(y+3)}{y+3}$$

Now we are going to simplify by making sure everything is factored first, and then we will reduce.

$$\text{Ex. 1} \quad \frac{2x-10}{x-5}$$

$$\text{Ex. 2} \quad \frac{y^2-25}{y^2+3y-10}$$

You try!

$$1. \quad \frac{2x(x+4)}{x^2-6x}$$

$$2. \quad \frac{z^2+6z-40}{z^2-8z+16}$$

Multiplication – make sure you factor first, then reduce top to bottom OR diagonally.

$$\text{Ex. 1 } \frac{x^2 - 9}{4} \bullet \frac{8}{x - 3}$$

$$\text{Ex. 2 } \frac{x^2 + 5x - 14}{x + 7} \bullet \frac{15}{3x - 6}$$

Division – First you must flip the second fraction and change the division symbol into multiplication. Second you must factor (if possible). Third you reduce top to bottom OR diagonally.

$$\text{Ex. 1 } \frac{x}{x + 2} \div \frac{x^2}{x^2 + 5x + 6}$$

$$\text{Ex. 2 } \frac{2x + 8}{x^2 - 16} \div \frac{10x - 20}{x - 4}$$

Ex. 3 Special Case ☺ If you notice the denominators are almost the same. There is a way to flip it around so we can reduce the binomials.... Multiply by -1 to the fraction that needs to be flipped around!

$$\frac{10}{x - 3} \div \frac{5}{3 - x}$$

You try!

$$1. \frac{x^2 + 6x + 9}{x^2 + 5x + 6} \cdot \frac{x + 2}{4}$$

$$2. \frac{4r + r^2}{8 + 2r} \cdot \frac{4}{2r}$$

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

$$4. \frac{x^2 - 5x}{x^2 - 7x + 12} \div \frac{x^2 - 25}{x^2 + x - 20}$$

$$5. \frac{x - 7}{12} \div \frac{7 - x}{-3}$$

Please hand in when you are finished!

Simplify.

$$(1) \frac{2x^2 - 6x}{x^2 + 18x + 81} \div \frac{x^2 - 9}{9x + 81}$$

$$(2) \frac{4x^2 - 1}{2x^2 - 5x - 3} \cdot \frac{x^2 - 6x + 9}{2x^2 + 5x - 3}$$