

SIMPLIFYING RATIONAL EXPRESSIONS

ALGEBRA 2 WITH TRIGONOMETRY

Simplifying a rational expression into its lowest terms is an extremely useful skill. You should be familiar with it from your first course in algebra. The basic principle is reviewed in *Exercise #1*.

Exercise #1: Recall that to multiply fractions, one simply multiplies their numerators and denominators.

(a) Simplify the numerical fraction $\frac{18}{12}$ by first expressing it as a product of two fractions, one of which is equal to one.

(b) Simplify the algebraic fraction $\frac{x^2-9}{2x+6}$ by first expressing it as the product of two fractions (factor!), one of which is equal to one.

Every time we simplify a fraction, we are essentially finding all common factors of the numerator and denominator and dividing them to be equal to one. Key in this process is that the numerator and denominator **must be factored** and **only factors cancel each other**. This is true whether our fraction contains monomial, binomial, or polynomial expressions.

Exercise #2: Simplify each of the following monomials dividing other monomials.

(a) $\frac{3x^5y^6}{6x^8y^3}$

(b) $\frac{20x^{10}y^8}{4x^2}$

(c) $\frac{7x^3y}{21x^5y^8}$

Exercise #3: Which of the following is equivalent to $\frac{10x^6y^3}{15x^2y^6}$?

(1) $\frac{2x^3}{3y^2}$

(3) $\frac{2x^4}{3y^3}$

(2) $\frac{3x^8}{2y^9}$

(4) $\frac{3x^2}{2y^3}$



When simplifying rational expressions that are more complex, always factor first, then identify common factors that can be cancelled.

Exercise #4: Simplify each of the following rational expressions.

(a) $\frac{x^2 + 5x - 14}{x^2 - 4}$

(b) $\frac{4x^2 - 1}{10x - 5}$

(c) $\frac{3x^2 + 14x + 8}{x^2 - 16}$

A special type of simplifying occurs whenever expressions of the form $(x - y)$ and $(y - x)$ are involved.

Exercise #5: Simplify each of the following fractions.

(a) $\frac{9 - 6}{6 - 9}$

(b) $\frac{15 - 3}{3 - 15}$

(c) $\frac{a - b}{b - a}$

Exercise #6: Which of the following is equivalent to $\frac{2x - 10}{25 - x^2}$?

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

(3) $\frac{x + 5}{2}$

(2) $\frac{2 - x}{5}$

(4) $\frac{2}{x - 5}$

Exercise #7: Which of the following is equivalent to $\frac{x^2 - 6x + 9}{18 - 6x}$?

(1) $\frac{-x - 3}{6}$

(3) $\frac{x + 3}{9}$

(2) $\frac{x - 3}{6}$

(4) $\frac{3 - x}{6}$



Name: _____

Date: _____

SIMPLIFYING RATIONAL EXPRESSIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Write each of the following ratios in simplest form.

(a) $\frac{5x^8}{20x^2}$

(b) $\frac{-12y^3}{8y^{12}}$

(c) $\frac{6x^{10}y^2}{15x^4y^5}$

(d) $\frac{24x^3y^7}{12x^6y^{10}}$

2. Which of the following is equivalent to the expression $\frac{4x^6y^4}{12x^2y^6}$?

(1) $\frac{x^4}{3y^2}$

(3) $\frac{3x^3}{y^2}$

(2) $\frac{3y^2}{x^3}$

(4) $\frac{x^3}{3y^2}$

3. Simplify each of the following rational expressions.

(a) $\frac{x^2 - 25}{4x - 20}$

(b) $\frac{x^2 + 11x + 24}{x^2 - 9}$

(c) $\frac{4x^2 - 1}{5x - 10x^2}$

(d) $\frac{9x^2 - 4}{3x^2 + 4x - 4}$

(e) $\frac{7x^2 - 42x}{x^2 + 2x - 48}$

(f) $\frac{2x^2 - 3x - 5}{25 - 4x^2}$



4. Which of the following is equivalent to the fraction $\frac{x^2 - 9x + 18}{15x - 5x^2}$?

(1) $\frac{x-3}{5x}$

(3) $\frac{6-x}{5x}$

(2) $\frac{x+6}{5x}$

(4) $\frac{-x-6}{5x}$

5. The rational expression $\frac{2x^2 + 7x + 6}{x^2 - 4}$ can be equivalently rewritten as

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

(3) $\frac{2x-3}{2-x}$

(2) $\frac{2x+1}{x-6}$

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

6. Written in simplest form, the fraction $\frac{y^2 - x^2}{5x - 5y}$ is equal to

(1) $5y - 5x$

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

(2) $\frac{y-x}{5}$

(4) $\frac{x-y}{5}$

REASONING

7. When we simplify an algebraic fraction, we are not truly producing completely equivalent expressions.

Consider the expressions $\frac{x^2 - 4}{4x - 8}$ and $\frac{x + 2}{4}$.

(a) Show by simplifying the first expression that these two are equivalent.

(b) Are both of these expressions defined for all values of x ? If not, which fraction is restricted and at what x -value(s) is it restricted?

