

Chapter 5 – Rational Expressions

Section 5.1 – Simplifying Rational Expressions

What is a Rational Expression?

Examples:

Evaluate $\frac{x-3}{5x+1}$ when $x = 4$ and when $x = -3$

Where to place the negative sign?

Identifying when a Rational Expression is Undefined

What happen to $\frac{x}{x+3}$ when $x = -3$?

A RATIONAL EXPRESSION IS UNDEFINED FOR VALUES THAT MAKE THE
DENOMINATOR _____

Examples:

Are there any values for x for which each rational expression is undefined?

- $\frac{x}{x+2}$
- $\frac{x-3}{x^2+5x+4}$
- $\frac{x^2-3x+2}{5}$

Simplifying Rational Expressions

Can you simplify $\frac{24}{54}$?

Can you simplify $\frac{x^4}{3x^2}$?

Can you simplify $\frac{2x+4}{x+2}$?

Can you simplify $\frac{x^2+2x}{x^2+4x+4}$?

Fundamental Principle of Rational Expressions

If $\frac{P}{Q}$ is a rational expression and R is a nonzero polynomial then $\frac{PR}{QR} = \frac{P}{Q}$

In other words, we can simplify _____ only.

Steps to Simplify a Rational Expression

1. Factor completely the _____ and the _____
2. Apply the fundamental principle of rational expressions to divide out _____
_____.

Examples:

Simplify the following rational expressions

- $\frac{x^4 + x^3}{5x + 5}$

- $\frac{x + 5}{x^2 - 25}$

- $\frac{x^2 + 11x + 18}{x^2 + x - 2}$

- $\frac{x + 4}{4 + x}$

- $\frac{x^2 + 10x + 25}{x^2 + 5x}$

- $\frac{x - 4}{4 - x}$

COMMON ERROR → you can only cancel out **FACTORS**...you cannot cancel out **TERMS**.

- $\frac{3-1}{3+5}$

- $\frac{2x+10}{2}$

- $\frac{2x+3}{2}$

YOU NEED TO REMEMBER HOW TO FACTOR COMPLETELY!

Simplify:

- $\frac{x^2 + xy + 2x + 2y}{x + 2}$

- $\frac{x^2 - 16}{x^2 - 8x + 16}$