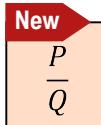


## TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS

### Intro to Rational Expressions and Functions

◆ A **rational expression** has a \_\_\_\_\_ in the numerator ( $P$ ) & denominator ( $Q$ ):



► A **rational function** is defined by a rational expression.

Recall	Rational Number	New	Rational Expression/Function
Quotient of two [ INTEGERS   POLYNOMIALS ]  $\frac{11}{35} \neq 0$			Quotient of two [ INTEGERS   POLYNOMIALS ]  $\frac{4x}{x-2} = \underbrace{\frac{4x}{x-2}}_{\text{Rational Expression}} \neq 0; \quad x \text{ cannot be } \underline{\quad}$  $\underbrace{\quad}_{\text{Rational Function}}$

◆ Since the denominator of the rational function  $\neq 0$ , the domain excludes any  $x$ -value that makes the denom 0.

**EXAMPLE** For the expression  $f(x) = \frac{x-1}{2x-6}$ , answer the following.

(A) Find the domain. Hint: Set the denom = 0 & solve for  $x$ .

(B) Evaluate at  $x = 2$ .

Set builder:  $\{ \quad | x \text{ is a real number, } \underline{\quad} \}$

Interval: \_\_\_\_\_

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **PRACTICE**

Determine the domain of the function below. Write in interval notation.

**(A)**

$$f(x) = \frac{5}{x}$$

**(B)**

$$f(x) = \frac{7}{x-3}$$

**(C)**

$$f(x) = \frac{x+1}{x^2-9}$$

### **PRACTICE**

Evaluate the rational expression for the given value of  $x$ .

**(A)**

$$\frac{12}{x+3}, \quad x = -1$$

**(B)**

$$\frac{x^2 - 4}{x^2 - x - 6}, \quad x = 2$$

**(C)**

$$\frac{3x}{x^2 + x - 6}, \quad x = -2$$

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **PRACTICE**

Determine the domain of the function  $h(x)$ .

$$h(x) = \frac{x^2 - 2x - 8}{x^2 - 5x + 4}$$

### **PRACTICE**

Given the function below, evaluate  $f(2)$ .

$$f(x) = \frac{3}{11 - x}$$

### **PRACTICE**

Given the function below, evaluate  $f(2)$ .

$$f(x) = \frac{3x + 4}{x^2 + 7x + 20}$$

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **Simplifying Rational Expressions**

◆ To simplify a rational expression, \_\_\_\_\_ numerator & denominator completely and \_\_\_\_\_ common factors.

Recall	Simplify Rational #'s	New	Simplify Rational Expressions
$\frac{28}{35}$	<p><b>Factor completely:</b> <math>\frac{7 \cdot 4}{7 \cdot 5}</math></p> <p><b>Cancel common factors:</b> <math>\frac{\cancel{7} \cdot 4}{\cancel{7} \cdot 5}</math></p> <p><b>Simplified answer:</b> <math>\frac{4}{5}</math></p>	<p><b>Factor completely:</b></p> <p><b>Cancel common factors:</b></p> <p><b>Simplified answer:</b></p>	$\frac{28x^3}{35x^5}$

### **EXAMPLE**

Simplify the following expressions.

**(A)**

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

**(B)**

$$\frac{x-5}{3x^2 - 15x}$$

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **PRACTICE**

Simplify the rational expression by factoring.

(A) 
$$\frac{6x}{12x}$$

(B) 
$$\frac{x^2 - 9}{x^2 - 3x}$$

(C) 
$$\frac{x^2 - 4x}{x^2 - 2x - 8}$$

### **PRACTICE**

Simplify each expression.

(A) 
$$\frac{x - 7}{7 - x}$$

(B) 
$$\frac{x^2 - 10x + 24}{(4 - x)(6 - x)}$$

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **EXAMPLE**

Write three equivalent expressions of the rational expression below:

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

### **EXAMPLE**

Which of the following rational expressions is equal to  $-5$ ?

(A)  $\frac{10x}{2x}$

(B)  $\frac{25 - 5x}{x}$

(C)  $-\frac{15x}{3(-x)}$

(D)  $\frac{20 - 5x}{(x - 4)}$

### **PRACTICE**

Simplify the rational expression below:

$$\frac{x^2 + 5x + 6}{x^2 + 7x + 10}$$