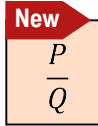


## TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS

### 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 ]  $\frac{4x}{x-2}$ $\neq 0$ ; $x$ cannot be ____  Rational Expression 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: { \_\_\_\_\_ |  $x$  is a real number, \_\_\_\_\_ }

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
	$\frac{28}{35}$		$\frac{28x^3}{35x^5}$
	<b>Factor completely:</b> $\frac{7 \cdot 4}{7 \cdot 5}$		<b>Factor completely:</b>
	<b>Cancel common factors:</b> $\frac{\cancel{7} \cdot 4}{\cancel{7} \cdot 5}$		<b>Cancel common factors:</b>
	<b>Simplified answer:</b> $\frac{4}{5}$		<b>Simplified answer:</b>

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

### **EXAMPLE**

Write three equivalent expressions of the rational expression below:

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

## **TOPIC: SIMPLIFYING RATIONAL EXPRESSIONS**

### **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:

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