

When you are done with your homework you should be able to...

- $\pi$  Evaluate a Rational Expression.
- $\pi$  Determine Undefined Values of a Rational Expression.
- $\pi$  Simplify Rational Expressions.

WARM-UP:

1. Evaluate each of the following expressions at  $x = -2$ .

a.  $\frac{x^3 + 5}{x^2}$

b.  $x + \frac{5}{x^2}$

2. Factor the following polynomials.

a.  $x^2 + 7x + 6$

b.  $8x^3 + 27$

c.  $6x^2 + 5x - 4$

3. Divide and simplify.

$$\frac{3x^2y^5}{105x^2y}$$

**Definition: Rational Expression**

A **rational expression** is the \_\_\_\_\_ of two \_\_\_\_\_.  
Suppose  $p$  and  $q$  are polynomials. Write a rational expression using  $p$  and  $q$ .

Make up 3 rational expressions and write them down below:

1.

2.

3.

Evaluate the following rational expressions at the given value:

1.  $\frac{2a+25}{a^2-1}$ ,  $a=3$

2.  $-\frac{m^2-25}{(m-5)^2}$ ,  $m=-2$

What are undefined values of a rational expression?

A rational expression is **undefined** for those values of the variable(s) that make the \_\_\_\_\_.

Determine the value(s) for which the following rational expressions are undefined:

1.  $\frac{5}{x}$

2.  $\frac{5}{x-3}$

3.  $\frac{5}{2x-3}$

4.  $\frac{x-5}{x-5}$

5.  $\frac{5x}{x^2-x-6}$

### Simplifying Rational Expressions

If  $p$ ,  $q$ , and  $r$  are polynomials, then  $\frac{p \cdot r}{q \cdot r} = \frac{p}{q}$  if  $r \neq 0$  and  $q \neq 0$ .

Make up your own  $p$ ,  $q$ , and  $r$ , write a rational expression, and simplify.

### Steps to Simplify a Rational Expression

Step 1: Completely factor the numerator and denominator of the rational expression.

Step 2: Divide out common factors.

Simplify the following rational expressions:

1.  $\frac{27}{387}$

2.  $\frac{x^2 - 5x}{3x^2 - 16x + 5}$

3.  $\frac{1-x}{x^2-1}$

$$4. \frac{x^2 - 9}{x^3 - 27}$$

$$5. \frac{n^3 + 3n^2 - 8n - 24}{n^3 - 4n^2 + 3n - 12}$$

### Applications

A formula to calculate the body mass index (BMI) when the weight  $w$  is in pounds, and the height  $h$  is in inches, is given by  $\text{BMI} = \frac{705w}{h^2}$ . What is the BMI of a person weighing 120 pounds who is 5 feet tall?