***Chapter 8 – 2: NOTES***

**Simplifying Rational Expressions**

**Definitions and General Properties of**

**Rational Numbers and Rational Expressions**

A **rational number** can be written as a quotient of two integers, in the form , where the denominator, b, is not 0.

A **rational expression** is the indicated quotient of two polynomials where the value of the denominator is assumed to be nonzero.

**Sign rules of rational numbers and expressions:**

1. 

2. 

**Fundamental Principle of Fractions:**

If b and k are nonzero integers and a is any integer, then.

**Simplifying a rational expression:**

1. Completely factor the polynomial given in the numerator and denominator.

2. Apply the fundamental principle of fractions by dividing the common factor or factors.

3. The simplest form will be the quotient of the product of remaining factors in the numerator and the product of remaining factors in the denominator.

**Warm-up 1. Reduce to lowest terms:**

**a)**= = **b)**= =

**c)**= = **d)** = =

=

**Problems - Simplify:**

**1.** **2.**

**3.** **4.**

**Multiplying and Dividing Rational Expressions**

**Multiplying Rational Expressions**

**Basic definition for multiplying rational numbers:**

If a, b, c, and d are integers with b and d not equal to zero, then.

**Multiplying rational expressions:**

1. Completely factor each numerator and denominator.

2. Apply the basic definition for multiplying rational numbers by rewriting the numerator as a product of factors and rewrite the denominator as a product of factors.

3. Simplify by dividing common factors.

4. The result is the quotient of the product of remaining factors in the numerator and the product of remaining factors in the denominator.

**Warm-up 1. Multiply and simplify:**

**a)**= = **b)**= = \_\_\_\_

**c)**= =

**Problems - Perform the indicated operation. Express in simplest form:**

**1.** **2.**

**3.**

**Basic definition for dividing rational numbers:**

If a, b, c, and d are integers with b, c, and d not equal to zero, then .

Note:are called reciprocals or multiplicative inverses.

**Dividing rational expressions:**

1. Apply the basic definition for dividing rational numbers.

2. Follow the steps for multiplying rational expressions in summary 1.

**Dividing Rational Expressions**

**Warm-up 2. Divide and simplify:**

**a)**= = **b)**=

= =

**c)**=

= =

**Problems - Perform the indicated operation. Express in simplest form:**

**4.**

**5.**

**6.**

**Basic definition for adding rational numbers with a common denominator:**

If a, b, and c are integers and b is not zero, then.

**Equivalent fractions** are fractions with different denominators that name the same number.

The **LCD**, **least common denominator**, is the least common multiple of a set of denominators. The **LCD** can be determined by inspection or by writing the product of the highest power for each factor in any given polynomial.

**Adding rational expressions:**

1. Determine if the given rational expressions have a common denominator.

2. If not, find the LCD.

3. Rewrite the given rational expressions as equivalent rational expressions using the LCD in the denominators.

4. Apply the basic definition for adding rational numbers with a common denominator.

5. Express result in simplest form.

***Chapter 8 – 3: NOTES***

**Adding Rational Expressions**

**Warm-up 1. Add and simplify:**

**a)**=== -------- b**)** The LCD is \_\_\_\_\_\_\_.

= ==

**c)** The LCD is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

= = =

**Problems - Add and express in simplest form:**

**1.** **2.**

**3.** **4.**

**Basic definition for subtracting rational numbers with a common denominator:**

If a, b, and c are integers and b is not zero, then.

**Subtracting rational expressions:**

1. Determine if the given rational expressions have a common denominator.

2. If not, find the LCD.

3. Rewrite the given rational expressions as equivalent rational expressions using the LCD in the denominator.

4. Apply the basic definition for subtracting rational numbers with a common denominator.

5. Express in simplest form.

**Subtracting Rational Expressions**

**Warm-up 2. Subtract and simplify:**

**a)**= = =

**b)**= The LCD is \_\_\_\_\_\_\_\_\_\_.

= = =

**c)**= The LCD is \_\_\_\_\_\_\_\_\_\_.

= = = =

**Problems - Subtract and simplify:**

**5.** 

**6.** 

**7.** 

**More on Rational Expressions and Complex Fractions**

**Complex fractions** are fractional forms that contain rational numbers or rational expressions in the numerators and/or denominators.

**Simplifying a complex fraction - Method A:**

1. If necessary, perform the indicated operation in the numerator and/or denominator.

2. Rewrite the indicated quotient as the division of two rational numbers or rational expressions.

3. Apply the basic definition for dividing rational numbers.

**Simplifying a complex fraction - Method B:**

1. Find the LCD of the rational numbers or rational expressions in the given complex fraction.

2. Multiply both numerator and denominator by the LCD to obtain an equivalent fraction. (If necessary, apply the distributive property.)

3. Simplify the resulting expression.

**Warm-up - Simplify using method A:**

**a)**= = = =

**b)**= = = = =

**Simplify using method B:**

**c)**= = =

**d)**= = = =

**Problems - Simplify:**

**1.** 

**2.** 

**3.** 