**Pre-Calculus Rational Expressions Organizer and Notes**

**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.

**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.

**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.

**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.

**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.

**Solving equations involving rational expressions:**

1. Determine the restricted values for each rational expression in the given equation.

2. Find the LCD in the equation.

3. Apply the multiplication property of equality, using the LCD, to clear the equation of all fractional forms.

4. Solve the resulting equivalent equation.

5. Check when directed to do so.

Note: If a restricted value results as a solution to the equation found in step 4, then the solution set is .