Name: ___________________________________ Date: _________________

SOLVING RATIONAL INEQUALITIES
COMMON CORE ALGEBRA II

We have already seen the solving of inequalities including quadratic expressions. Rational inequalities, those that include algebraic fractions with variables in both their numerator and denominator, are important and pose an interesting challenge compared with quadratics. The first exercise will illustrate the thinking involved in finding the **solution set** to a rational inequality.

***Exercise* #1:** Consider the rational inequality $\frac{x-5}{x+3} \geq 0$.

(a) At what x-value is the ratio $\frac{x-5}{x+3}$ equal to zero? Is this value part of the solution set?

(b) At what x-value is the ratio $\frac{x-5}{x+3}$ undefined? Is this value part of the solution set?

(c) Enter the ratio $\frac{x-5}{x+3}$ in your calculator to help determine values of x that solve this inequality. Plot its solution on a number line and state the answer in set-builder notation.

The key to solving rational inequalities **that are compared to zero** is to find the values of x that make the numerator or denominator equal to zero. These are known as the **critical values** of the rational expression. **The rational expression can only change signs at these critical values.**

***Exercise* #2:** Solve the rational inequality $\frac{x^2+3x-4}{x^2-6x+9} < 0$ for all values of x. Show your solution on a number line and state its solution in either interval or set-builder notation.

If a single algebraic ratio is compared to zero, then the solution method is fairly straightforward. It becomes more difficult if there exists more than one ratio or if the ratio is being compared to a quantity other than zero. In both cases, it is important to algebraically manipulate the expression so that we are comparing it to zero.

***Exercise* #3:** Solve the rational inequality $\frac{x}{x-8} \leq 5$. Represent your answer using a number line and using set-builder or interval notation.

Some of these inequalities can test all of your key fraction abilities.

***Exercise* #4:** Solve the rational inequality $\frac{x-1}{x} + \frac{x+2}{x+3} < \frac{3}{2}$. Represent your answer using a number line and using any appropriate notation.

Name: ___________________________________ Date: _________________

SOLVING RATIONAL INEQUALITIES
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

Solve each of the following rational inequalities. Show your answers using a number line and an appropriate notation.

1. $\frac{x-10}{x+5} \geq 0$

2. $\frac{2x+1}{x+3} < 0$

3. $\frac{x^2-4}{x^2-x-20} > 0$

4. $\frac{x^2-6x-16}{x^2-x-6} \leq 0$

5. $\frac{x^2+6x+9}{4x^2-3x-1} \geq 0$

6. $\frac{x^2-12x+36}{4x^2-4x+1} < 0$

For problems 7 through 9, solve each rational inequality by first comparing it to zero. Represent your answers on a number line and using appropriate notation.

7. $\frac{x+1}{x-3} \leq 2$

8. $\frac{x^2+2x}{x+4} > \frac{4}{3}$

9. $\frac{1}{x-2} - \frac{1}{x+2} \geq \frac{3}{x^2-4}$