Name: _____ Date: _____

INTRODUCTION TO RATIONAL FUNCTIONS
COMMON CORE ALGEBRA II

Rational functions are simply the ratio of polynomial functions. They take on more interesting properties and have more interesting graphs than polynomials because of the interaction between the numerator and denominator of the fraction. In Common Core Algebra II, we will be primarily concerned with the algebra of these functions. But in this lesson we will explore some of their characteristics.

***Exercise* #1:** Consider the rational function given by $f(x)=\frac{x+6}{x-3}$.

(a) Algebraically determine the *y*-intercept for this function.

(b) Algebraically determine the *x*-intercept of this function. Hint – a fraction can only equal zero if its numerator is zero.

(c) For what value of *x* is this function undefined? Why is it undefined at this value?

(d) Based on (c), state the domain of this function in set-builder notation.

***Exercise* #2:** Find all values of *x* for which the rational function $h(x)=\frac{x+5}{2x^2+11x-6}$ is undefined. Verify by using your calculator to evaluate this expression for these values.

***Exercise* #3:** Which of the following represents the domain of the function $f(x)=\frac{x-3}{x^2-6x-16}$?

(1) $\{x \mid x \neq \pm 4\}$

(2) $\{x \mid x \neq 3\}$

(3) $\{x \mid x \neq -2 \text{ and } 8\}$

(4) $\{x \mid x \neq -6 \text{ and } 3\}$

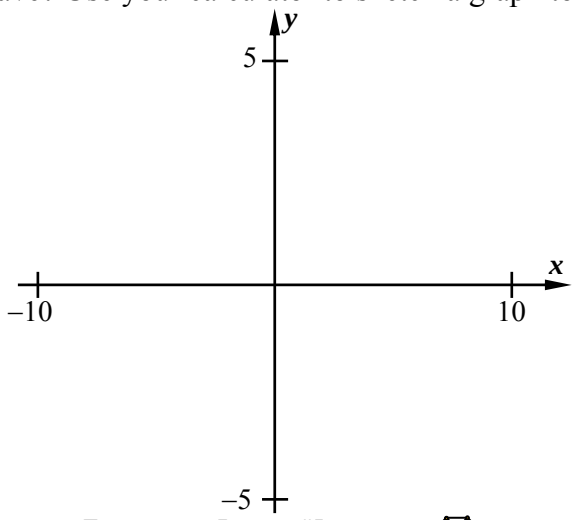
Exercise #4: If $g(x)=3x-2$ and $f(x)=\dfrac{2x+1}{x+5}$ then find:

(a) $f(g(-2))$ (b) $f(g(2))$ (c) $f(g(x))$

Exercise #5: Find formulas for the inverse of each of the following simple rational functions below. Recall that as a first step, switch the roles of *x* and *y*.

(a) $y=\dfrac{x}{x-2}$ (b) $y=\dfrac{x+3}{2x}$

Exercise #6: The function $f(x)=\dfrac{x^2-8}{4x}$ is either an even or an odd function. Determine which it is and justify. Based on your answer, what type of symmetry must this function have? Use your calculator to sketch a graph to verify.



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INTRODUCTION TO RATIONAL FUNCTIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Which of the following values of x is *not* in the domain of $f(x)=\frac{x+3}{x-7}$?

   (1) $x=-7$ (3) $x=3$

   (2) $x=7$ (4) $x=-3$ _____

2. Which of the following values of x is *not* in the domain of $g(x)=\frac{4x-1}{2x+1}$?

   (1) $x=-\frac{1}{2}$ (3) $x=\frac{1}{4}$

   (2) $x=-1$ (4) $x=-3$ _____

3. Which values of x, when substituted into the function $y=\frac{x-4}{2x^2+8x}$, would make it undefined?

   (1) $x=2$ and 8 (3) $x=-4$ and 4

   (2) $x=-4$ and 8 (4) $x=-4$ and 0 _____

4. Which of the following represents the domain of $y=\frac{x^2-4}{x^2+5x-14}$?

   (1) $\{x \mid x\neq \pm 2\}$ (3) $\{x \mid x\neq -4 \text{ and } 14\}$

   (2) $\{x \mid x\neq -7 \text{ and } 2\}$ (4) $\{x \mid x\neq -5 \text{ and } 14\}$ _____

5. Which of the following represents the domain of $g(x)=\frac{3x-1}{2x^2-x-10}$?

   (1) $\left\{x \mid x\neq \frac{1}{3}\right\}$ (3) $\left\{x \mid x\neq -\frac{1}{2} \text{ and } 5\right\}$

   (2) $\left\{x \mid x\neq -\frac{1}{3} \text{ and } \frac{1}{2}\right\}$ (4) $\left\{x \mid x\neq -2 \text{ and } \frac{5}{2}\right\}$ _____

6. If $f(x)=2x+7$ and $g(x)=\frac{x^2-4}{2x+1}$ then $g(f(-5))=?$

   (1) -1 (3) 6

   (2) 2 (4) -3 _____

7. If $f(x)=\frac{3x-2}{2x}$ and $g(x)=4x-1$ then $f(g(x))=?$

(1) $\frac{7x-3}{2x}$ (3) $\frac{12x-5}{8x-2}$

(2) $\frac{12x-9}{8x-2}$ (4) $\frac{5x-4}{x}$ _____

8. The y-intercept of the rational function $y=\frac{2x+15}{x-3}$ is

(1) 15 (3) -3

(2) -5 (4) 12 _____

9. Find formulas for the inverse of each of the following rational functions.

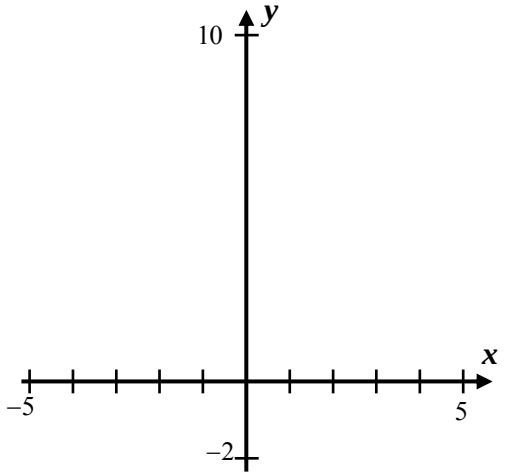
(a) $y=\frac{5x}{x-2}$ (b) $y=\frac{3x+2}{x+4}$

10. Consider the rational function $y=\frac{9-x^2}{x^2+1}$.

(a) Find the function's y-intercept algebraically.

(b) Find the function's x-intercepts algebraically.

(c) Sketch the function on the axes below. Clearly label your x and y intercepts.



(d) Is this an even or an odd function? Explain graphically.