Name: ______________________________ Date: ______________

INTRODUCTION TO RATIONAL FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY

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 Algebra 2, 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?

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

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

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

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

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***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) $y=\dfrac{x+3}{2x}$

(c) $y=\dfrac{x-1}{x+1}$

(d) $y=\dfrac{2x-1}{x-4}$

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INTRODUCTION TO RATIONAL FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

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

(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 $g(x)=\dfrac{4x-1}{2x+1}$?

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

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

3. Which values of x, when substituted into the function $y=\dfrac{x-4}{2x^2+8x}$, 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 $y=\dfrac{x^2-4}{x^2+5x-14}$?

(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 $g(x)=\dfrac{3x-1}{2x^2-x-10}$?

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

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

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