PreCalculus Name: Period: Date:

10/29

Lesson 3-6: Rational Functions

Objective
Students will…
- Be able to understand what rational functions are and their behaviors.
- Be able to find the x and the y intercepts of rational functions.

Rational Functions
Whenever we hear the word "rational" in mathematics, it'd be safe to say many of us think of fractions. Hence, a rational function would be most commonly described as a "fractional" function. This is in essence true!
A rational function is a function of the form $r(x) =$, where P and Q are polynomials. We are also assuming that $P(x)$ and $Q(x)$ have no factor in common, i.e. they are completely __________________.

Behaviors of Rational Functions
Rational functions are often given special attention because, while they fit the standard definition of a function (one output for every input), they are quite unique in terms of their _________________ and _______________.
Consider the following rational function, $f(x) = \frac{1}{x}$
We can already see that there is something we need to make sure of, and that is the fact that $x \neq$, since a fraction is not defined when the denominator is a zero.

Also, as x or the denominator ____________________, the overall function __________________, and as x or the denominator _____________________, the overall function _________________.

Ex. $\frac{1}{2} > \frac{1}{12} > \frac{1}{45667}$

So, the behavior of this rational function, $f(x) = \frac{1}{x}$ can be written as,

$\lim_{x\to\infty} f(x) = 0$ and $\lim_{x\to 0} f(x) = \infty$

"The limit ____"
"The limit ____"

X and the Y-Intercepts of Rational Functions
Although we have observed how rational functions behave in a unique way, the concept of finding the x and the y intercepts remain the same for all functions.

Ex. Find the x and the y-intercepts of the function $f(x) = \frac{x-2}{3}$

Y-int: X-int:

Example

Find the x and the y intercepts of the following rational functions

1. $f(x) = \frac{1}{x}$
2. $r(x) = \frac{x}{2}$
3. $g(x) = \frac{x-5}{x-2}$
4. $f(x) = \frac{x^2-3x-18}{x+4}$
5. $r(x) = \frac{x^2+6}{2}$

Homework 10/29
TB pg. 298 #31-37 (odd), 41, 46