GUIDED NOTES – 5.6 RATIONAL FUNCTIONS

LEARNING OBJECTIVES

In this section, you will:

- Use arrow notation.
- Solve applied problems involving rational functions.
- Find the domains of rational functions.
- Identify vertical asymptotes.
- Identify horizontal asymptotes.
- Graph rational functions.

USING ARROW NOTATION

Study Table 1 in your textbook section to complete the able below.

Symbol	***Meaning***
$x \to a^+$	x approaches a from the _____ (x ____ a but close to a)
$x \to a^-$	x approaches a from the _____ (x ____ a but close to a)
$x \to \infty$	x approaches _____ (x _____ without bound)
$x \to -\infty$	x approaches _____ (x _____ without bound)
$f(x) \to \infty$	The output approaches _____ (The output _____ without bound)
$f(x) \to -\infty$	The output approaches _____ (The output _____ without bound)
$f(x) \to a$	The output approaches _____

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Study the box in your textbook section titled "vertical asymptote."

- A _____ asymptote of a graph is a vertical line $x =$ _____ where the graph tends towards positive or negative infinity as the inputs approach a.
- How would you write this using arrow notation?

Study the box in your textbook section titled "horizontal asymptote."

- A _____ asymptote of a graph is a horizontal line $y =$ _____ where the graph approaches the line as the inputs increase or decrease without bound.
- How would you write this using arrow notation?

- A rational function is a function that can be written as the _____ of two polynomial functions.

FINDING THE DOMAINS OF RATIONAL FUNCTIONS

Study the box in your textbook section titled "domain of a rational function."

- The domain of a rational function includes all real numbers except those that cause the denominator to equal _____.

- Write out the 3 step process for finding the domain, given a rational function.
    1.
    2.
    3.

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Try It: Read Example 4 in the text, then answer the following.

Find the domain of $f(x) = \frac{4x}{5(x-1)(x-5)}$.

IDENTIFYING VERTICAL ASYMPTOTES OF RATIONAL FUNCTIONS

- Write out the 5 step process for identifying any vertical asymptotes of the graph, given a rational function.

1.

2.

3.

4.

5.

Study the box in your textbook section titled "removable discontinuities of rational functions."

- When does a *removable discontinuity* occur?

Try It: Read Examples 5 and 6 in the text, then answer the following.

Find the vertical asymptote and removable discontinuities of the graph $f(x) = \frac{x^2-25}{x^3-6x^2+5x}$.

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IDENTIFYING HORIZONTAL ASYMPTOTES OF RATIONAL FUNCTIONS

Study the box in your textbook section titled "horizontal asymptotes of rational functions."

- Degree of numerator is _____ degree of denominator, then there is a horizontal asymptote at _____.
- Degree of numerator is _____ degree of denominator by one, then there is no horizontal asymptote, but there is a _____ asymptote.
- Degree of numerator is _____ degree of denominator, then there is a horizontal asymptote at _____.

Try It: Read Examples 7, 8, and 9 in the text, then answer the following.

Find the vertical and horizontal asymptotes of the function $f(x) = \frac{(2x-1)(2x+1)}{(x-2)(x+3)}$.

Homework: *You should now be ready to attempt problems 1-4 in "Homework – Section 5.6" on WeBWorK.*

Study the box in your textbook section titled "intercepts of rational functions."

- A rational function will have a y-intercept when the _____ is zero, if the function is defined at zero.
- When will a rational function not have a y-intercept?

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- A rational function will have x-intercepts at the inputs that cause the output to be _____. Remember, x-intercepts can only occur when the _____ of the rational function equals zero.

Homework: *You should now be ready to attempt problem 5 in "Homework – Section 5.6" on WeBWorK.*

GRAPHING RATIONAL FUNCTIONS

- Write out the 8 step process for sketching a graph, given a rational function.

1.

2.

3.

4.

5.

6.

7.

8.

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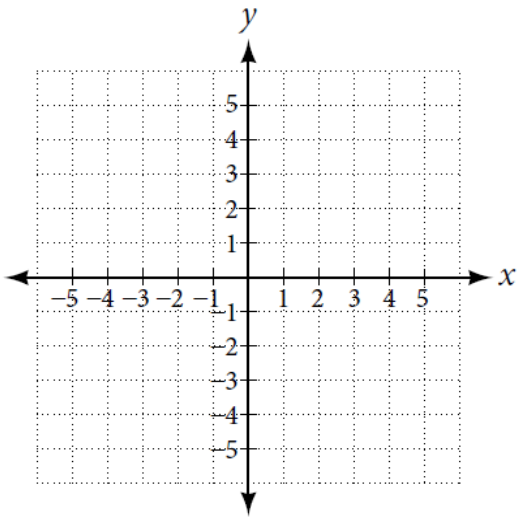
Try It: Read Example 11 in the text, then answer the following.

Given the function $f(x) = \frac{(x+2)^2(x-2)}{2(x-1)^2(x-3)}$, use the characteristics of polynomials and rational functions to describe its behavior and sketch the function.



WRITING RATIONAL FUNCTIONS

- Write out the 3 step process for writing a rational equation, given a graph of a rational function.

1.

2.

3.

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