

Unit 4 Guided Notes

Rational Functions

Standards: A.APR.6, A.CED.1, A.REI.2, A.REI.11, F.BF.1, F.BF.3

Clio High School – Algebra 2A

Name: _____

Period: _____

Need help? Support is available!

- Miss Seitz's tutoring: See schedule in classroom
- Website with all videos and resources
www.msseitz.weebly.com

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Concept #	What we will be learning...	Text
#1	Introduction to Rational Functions <input type="checkbox"/> Identify and explain the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k \cdot f(x)$, $f(k \cdot x)$, and $f(x+k)$ for specific values of k (both positive and negative) <input type="checkbox"/> Find the value of k given the graphs	8.2
#2	Rational Functions and Their Graphs <input type="checkbox"/> I can write a function that describes the relationships between two quantities <input type="checkbox"/> I can describe important features of rational functions based on their equations and graph	8.3
#3	Multiplying and Dividing Rational Expressions <input type="checkbox"/> Factor the top and bottom and cancel like parenthesis <input type="checkbox"/> Multiply and divide rational expressions	8.4
#4	Adding and Subtracting Rational Expressions <input type="checkbox"/> Add and subtract rational expressions	8.5
#5	Solving Rational Equations <input type="checkbox"/> Solve rational equations <input type="checkbox"/> Plug answers into the original equation to see if the denominator is zero or is not true	8.6

#1**Introduction to Rational Functions****Text: 8.2**

- Identify and explain the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k \cdot f(x)$, $f(k \cdot x)$, and $f(x+k)$ for specific values of k (both positive and negative)
- Find the value of k given the graphs

Vocabulary: asymptote

DefinitionsD _____ is the set of all x 's that will give us the graphR _____ is the set of all y 's that will give us the graph

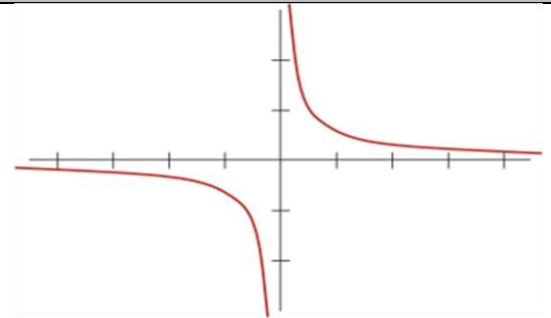
The A _____ are the lines that the graph gets very close to but does not touch or cross

 x - _____ is the value where the graph hits the x -axis (where $y = 0$) y - _____ is the value where the graph hits the y -axis (where $x = 0$)**The Parent Rational Function**The equation: $y = \frac{1}{x}$

Domain:

Range:

Asymptotes:

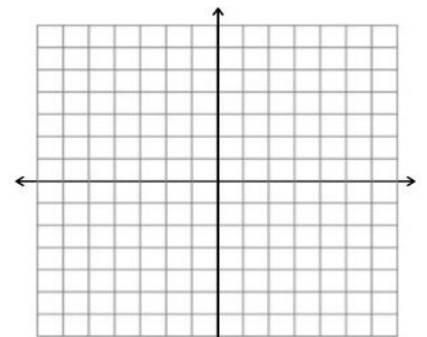
**Transforming the Graph**

$$y = \frac{a}{x - h} + k$$

Example 1: Identify the domain and range. Sketch the graph.

$$y = \frac{2}{x - 4} + 1$$

Asymptotes:

 x - intercept: y - intercept:

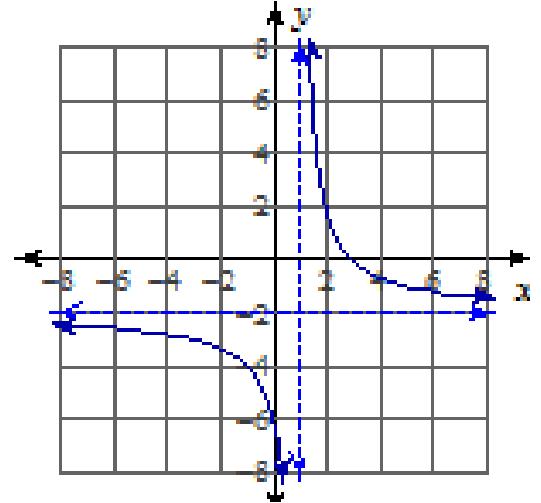
Writing the Equation of the Graph

Example 2: Write the equation of the graph.

Asymptotes:

x – intercept:

y – intercept:



You Try It!

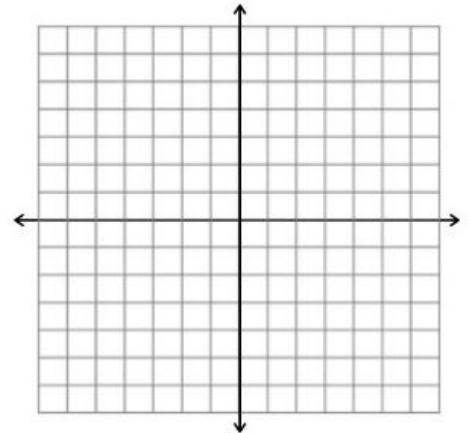
1.) Identify the domain and range. Sketch the graph.

$$y = \frac{2}{x + 2} - 3$$

Asymptotes:

x – intercept:

y – intercept:

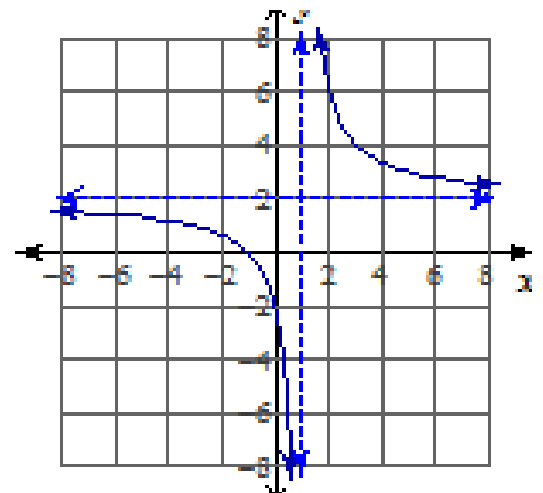


2.) Write the equation of the graph.

Asymptotes:

x – intercept:

y – intercept:



#2**Rational Functions and Their Graphs****Text: 8.3**

- I can write a function that describes the relationships between two quantities
- I can describe important features of rational functions based on their equations and graph

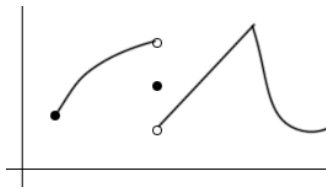
Vocabulary: rational function, continuous graph, discontinuous graph, point of discontinuity, removable discontinuity, non-removable discontinuity

Definitions

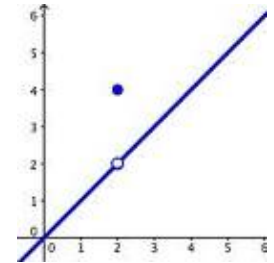
A C_____ F_____ has **NO** stops or breaks.

Example:

A D_____ F_____ has stops or breaks.

Example:

A P_____ of D_____ is any point at which there is a hole in the graph.

Example:**Vertical Asymptotes**

Where the denominator equals zero

Example 1: Identify the vertical asymptote(s).

$$y = \frac{3}{x + 2}$$

Example 2: Identify the vertical asymptote(s)

$$y = \frac{x - 4}{x^2 + x - 6}$$

You Try! Identify the vertical asymptotes of each.

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

2.) $y = \frac{x+5}{x-5}$

Identifying Holes

Anything that cancels

Example 3: Identify the holes in the graph. $y = \frac{x^2 + x - 6}{x^2 + 4x + 3}$

Steps:

1. Factor the top and bottom using X-Box
2. See what is the same on the top and bottom
3. Set factors that would cancel equal to zero and solve for x

You Try! Identify the holes of each graph.

3.) $y = \frac{2x^2 + 2x - 12}{x^2 + 3x}$

4.) $y = \frac{x^3 - 3x^2 - 4x}{x^3 - x}$

Real World Application

Example 4: You are planning a trip to Cedar Point. It costs \$1,000 to rent a bus for the day. Each person will have to pay \$7 to get in to the park at a group rate.

A: Write a function for the cost to each person

B: How many people do you need to sign up in order to make the cost \$30 or less per person? Does this number make sense?

#3

Multiplying and Dividing Rational Expressions

Text: 8.4

Factor the top and bottom and cancel like parenthesis

Multiply and divide rational expressions

Vocabulary: rational expression, simplest form, excluded value, simplify

Definitions

An E_____ VALUE is one that makes the denominator zero. It is excluded because you cannot divide by zero.

To S_____ means to factor the numerator and denominator as much as possible and see what cancels.

SIMPLIFY Rational Expressions

Example 1: Simplify and state excluded values

$$\frac{10n + 90}{n + 9}$$

Example 2: Simplify and state excluded values

$$\frac{n^2 + 3n - 40}{n^3 + 9n^2 + 8n}$$

MULTIPLY Rational Expressions

Factor everything and see what cancels!

Example 3: Simplify and state excluded values

$$\frac{x - 7}{x^2 + x - 56} \cdot \frac{x - 4}{x + 1}$$

Example 4: Simplify and state excluded values

$$\frac{5m}{15m^2 + 50m} \cdot \frac{15m^2 + 50m}{10}$$

DIVIDE Rational Expressions

Factor everything and then FLIP the 2nd guy. JUST LIKE FRACTIONS!

Example 5: Simplify and state excluded values

$$\frac{4}{K-2} \div \frac{2-2K}{2K-2}$$

Example 6: Simplify and state excluded values

$$\frac{-p^2 + 12p - 35}{2p^2} \div \frac{p^2 - 11p + 28}{p-4}$$

You Try It! Simplify and state excluded values

1.)
$$\frac{b^2 - 13b + 40}{b-5}$$

2.)
$$\frac{x^2+3x-10}{x+6} \circ \frac{7x}{x^2+3x-10}$$

#4**Adding and Subtracting Rational Expressions****Text: 8.5**

□ Add and subtract rational expressions

Vocabulary: like terms, complex fraction

Steps to Add/Subtract

1. Factor the numerator and denominator of each fraction
2. Determine LCD (Lowest Common Denominator)
3. Multiply the numerator and denominator of each fraction by what that fraction is "missing" from the LCD
4. Add or subtract across the top by combining like terms

Find the LCD (Lowest Common Denominator)

Example 1: $\frac{3}{t+5} + \frac{7}{t^2-25}$

Example 2: $\frac{w^2 + 12w + 32}{w^2 + 3w - 40} + \frac{1}{w - 5}$

Example 3: $\frac{y^2 - 10y + 21}{y^2 - 11y + 28} + \frac{y^2 - 7y + 12}{y^2 + y - 12}$

Adding & Subtracting

Example 4: $\frac{p^2 + 6p + 9}{p^2 - 4p - 21} + \frac{6}{p - 7}$

Example 5: $\frac{n^2 + n - 12}{n^2 - 11n + 24} - \frac{n^2 - 4n - 32}{n^2 + n - 12}$

You Try It!

1.)
$$\frac{d^2 + 4d - 32}{d^2 + 16d + 64} - \frac{9}{d + 8}$$

2.)
$$\frac{x^2 - 5x + 4}{x^2 - 5x + 4} + \frac{x^2 - 2x + 1}{x^2 + 4x - 5}$$

#5

Solving Rational Equations

Text: 8.6

- Solve rational equations
 - Plug answers into the original equation to see if the denominator is zero or is not true
- Vocabulary: rational equation

Steps to Solve Rational Equations

1. Factor the numerator and denominator completely
2. Find the LCD (Lowest Common Denominator)
3. Multiply the numerator of each term by the LCD
4. Cancel out any factors (your denominators should go away!)
5. Simplify
6. Solve for your variable

Make sure you check to see if your answers make the **ORIGINAL** denominators zero. These are the extraneous solutions!

Solving Rational Equations

Example 1: $\frac{2}{x} = \frac{x-1}{5x} - \frac{1}{x}$

Example 2: $\frac{3x+4}{3x^2} = \frac{5}{2x^2} + \frac{1}{6x}$

Example 3: $1 = \frac{1}{6x+3} + \frac{x-5}{2x+1}$

Example 4: $\frac{1}{p+3} = \frac{p-6}{p^2+3p} - \frac{5p-15}{p^2+3p}$

You Try It! Solve the rational equation. Be sure to check for extraneous solutions!

1.)
$$\frac{1}{n+3} - \frac{1}{4n+2} = \frac{n-1}{4n+2}$$

2.)
$$\frac{4}{m^2+4m-5} = \frac{6m+18}{m^2+4m-5} + 1$$