

Name: _____

Rational Functions Summative Task

Due Date: Tuesday, November 3rd @ 7:34:59 via Google Classroom

Directions

Complete this task on a separate piece of paper or Kami (pdf editor). You can use your notes, but this an individual assignment. **You should work alone.** Do not discuss this assignment with anyone else except your teacher.

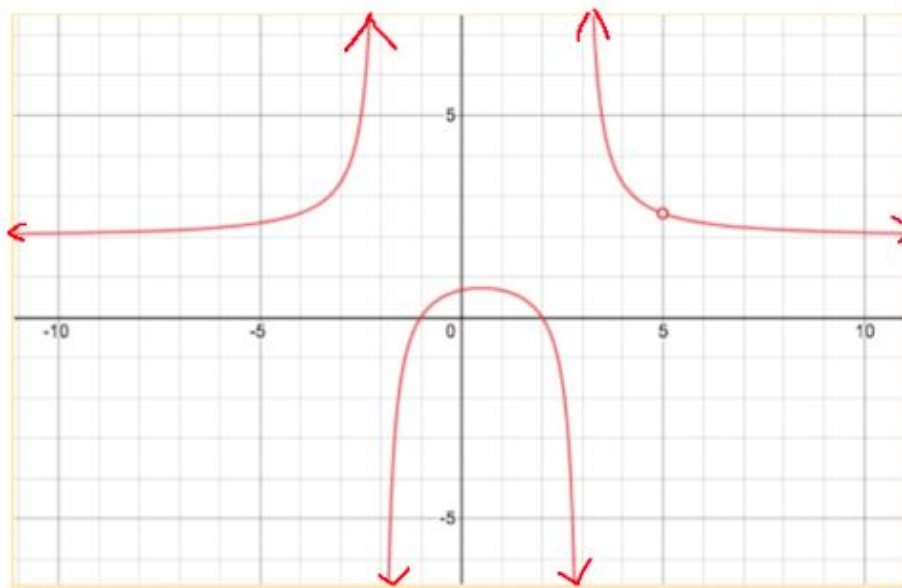
Correct answers without explanations/work will receive no credit and cheating will be assumed. If you are suspected of plagiarism/cheating, you will be asked to complete problems and explain them over Zoom in order to earn credit.

When you finish the task, take pictures of your work (camera or tiny scanner app) and add all pictures to ONE document. Make sure that your work is legible. Turn in that document on google classroom. If you are having technical difficulties with this process, email me the pictures/document.

Standard/Topic/Unit: F.IF.C.7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.	
Meets Competency Questions 1-4	☐ I can identify the features (domain, equation of vertical and horizontal asymptotes, coordinate of hole and x/y intercepts) of a rational function given its graph ☐ I can graph rational functions given its features ☐ I can identify the end behavior (HA/Oblique) of a rational function given its equation ☐ I can identify the domain, vertical asymptote, horizontal asymptote, hole, x-int, and y-int of a rational function from the factored form of its equation to graph the rational function.
Exceeds Competency Questions 5-7	☐ I can explain why vertical asymptotes and holes occur in rational functions ☐ I can explain why the rules for end behavior exist ☐ I can identify features of a rational function from an unfactored equation to graph the rational function
Honors Designation Questions 8-9	☐ I can find the oblique asymptote of a rational function from its equation (synthetic division) to graph a rational function. ☐ I can find limits of a rational function at vertical and horizontal asymptotes from a graph

Section 1: Meeting Competency

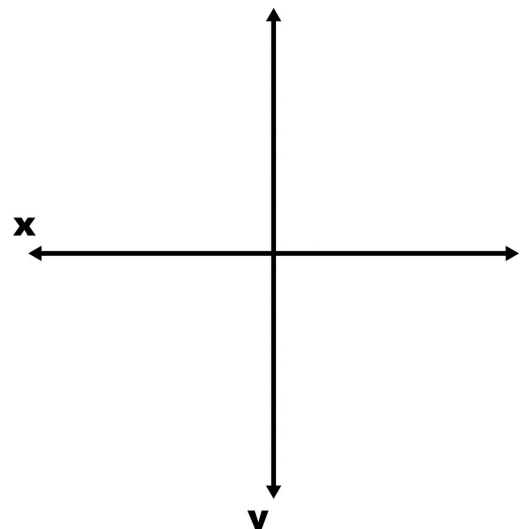
1. The graph below is a graph of rational function $h(x)$.



Sentence frame for explanations: On the graph I noticed..., so I know...

What is/are the equations of the vertical asymptote(s) of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.	What is the equation of the horizontal asymptote of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.
What is the coordinate of the hole of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.	What is/are the coordinate(s) of the x-intercept(s) of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.
What is the coordinate(s) of the y-intercept of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.	What is the domain of $h(x)$? Explain how you found your answer by describing what you were looking for on the graph to find the feature.

2. Draw one graph that has all the listed features.

Features: - Vertical asymptote at $x=2$ - Horizontal asymptote at $y=1$ - Hole at $(4, 4)$ - X-intercept at $(-4, 0)$ - Y-intercept at $(0, -2)$ Use the behavior around $x = 2$ below if it helps - As $x \rightarrow 2$ from the left, $y \rightarrow -\infty$ - As $x \rightarrow 2$ from the right, $y \rightarrow \infty$	Graph: Be sure to label axes 
---	--

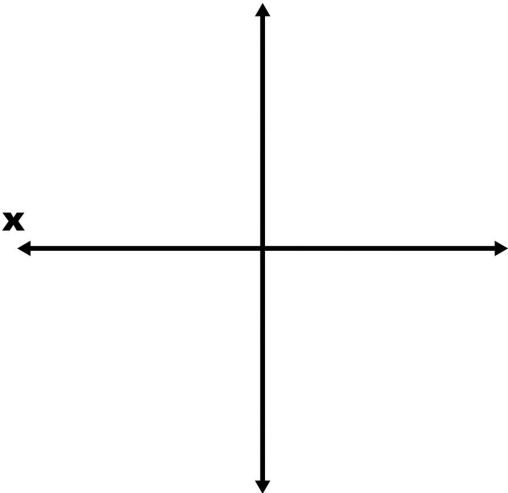
3. Match the equations below with its end behavior. Then, explain why your matches are correct using your knowledge of horizontal and oblique asymptotes. **Note: Not all letters will match.**

Equation	End Behavior
$1) f(x) = \frac{-3x - 12}{x^2 + 5}$ $2) f(x) = \frac{-3x - 12}{x + 5}$ $3) f(x) = \frac{-3x^2 - 12}{x + 5}$	A) As $x \rightarrow -\infty, y \rightarrow -3$ As $x \rightarrow \infty, y \rightarrow -3$ B) As $x \rightarrow -\infty, y \rightarrow \infty$ As $x \rightarrow \infty, y \rightarrow -\infty$ C) As $x \rightarrow -\infty, y \rightarrow 1$ As $x \rightarrow \infty, y \rightarrow 1$ D) As $x \rightarrow -\infty, y \rightarrow 0$ As $x \rightarrow \infty, y \rightarrow 0$ E) As $x \rightarrow -\infty, y \rightarrow 0$ As $x \rightarrow \infty, y \rightarrow -\infty$

Equation	End Behavior (A-E)	Explanation (In the equation, I noticed..., so I know..)
1		
2		
3		

4. Let $g(x) = \frac{(2x+1)(x-3)}{(x-2)(x-3)} = \frac{2x^2-5x-3}{x^2-5x+6}$. Identify the following features of $g(x)$ and then sketch a graph of $g(x)$. Show all work.

Sentence Frame: In the equation, I noticed..., so I know..

What is/are the equations of the vertical asymptote(s) of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.	What is the equation of the horizontal asymptote of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.
What is the coordinate of the hole of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.	What is/are the coordinate(s) of the x-intercept(s) of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.
What is the coordinate(s) of the y-intercept of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.	What is the domain of $g(x)$? Explain how you found your answer by describing what you were looking for in the equation to find the feature.
Graph  A blank Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. Both axes have arrows at their ends. The x-axis is labeled with a bold 'x' at its left end. The y-axis is unlabeled.	

Section 2: Exceeds Competency

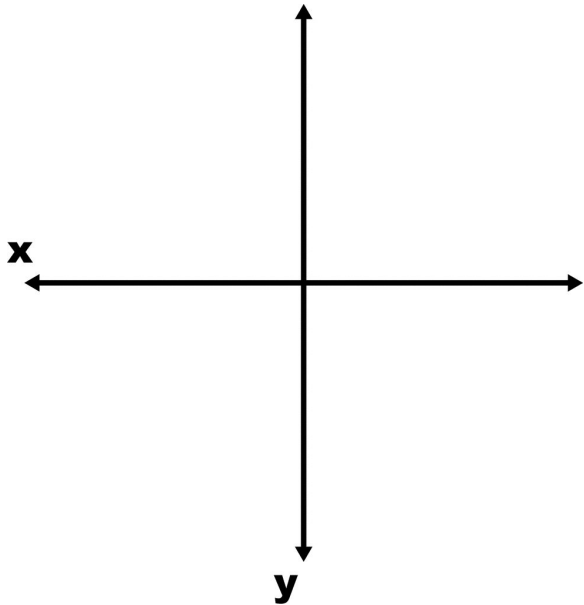
5. Pick one of the functions below. Then sketch a graph of the function showing correct end behavior and intercepts. **Be sure to show all work.**

1. $f(x) = \frac{x^2-9}{x^2-2x-3}$

2. $f(x) = \frac{x^2-x-6}{x^2+2x}$

3. $f(x) = \frac{x+2}{x^2+3x+2}$

I picked function _____

Work	Graph
	 A blank Cartesian coordinate system with a horizontal x-axis and a vertical y-axis. Both axes have arrows at both ends. The x-axis is labeled with a bold 'x' at its left end, and the y-axis is labeled with a bold 'y' at its bottom end. The axes intersect at the origin.

6.

Let $x = 6$ be the vertical asymptote of rational function $g(x)$. What would happen if you tried to evaluate the equation at that specific x value? Why?	Let $(-2,5)$ be the hole of rational function $g(x)$. What would happen if you tried to evaluate the equation at that specific x value? Why?
---	--

7. Consider the following tables that show the values of the function at various x-values.

Table 1

x	1	10	100	1000
$f(x) = \frac{4x^2+7x-1}{2x+3}$	$\frac{10}{5} = 2$	$\frac{469}{23} = 20.39$	$\frac{40699}{203} = 200.49$	$\frac{4006999}{2003} = 2000.5$

Table 2

x	1	10	100	1000
$g(x) = \frac{4x^2+7x-1}{2x^2+3}$	$\frac{10}{5} = 2$	$\frac{469}{203} = 2.31$	$\frac{40699}{20003} = 2.03$	$\frac{4006999}{2000003} = 2.003$

Table 3

x	1	10	100	1000
$h(x) = \frac{4x^2+7x-1}{2x^3+3}$	$\frac{10}{5} = 2$	$\frac{469}{2003} = .234$	$\frac{40699}{2000003} = .020$	$\frac{4006999}{2 \times 10^9} = .002$

How do these three tables demonstrate the different possible end behavior/horizontal asymptotes of rational functions? Explain using mathematical evidence from each of the tables. You may use the sentence frames below to help you.

“_____ in the table connects to _____ because...”

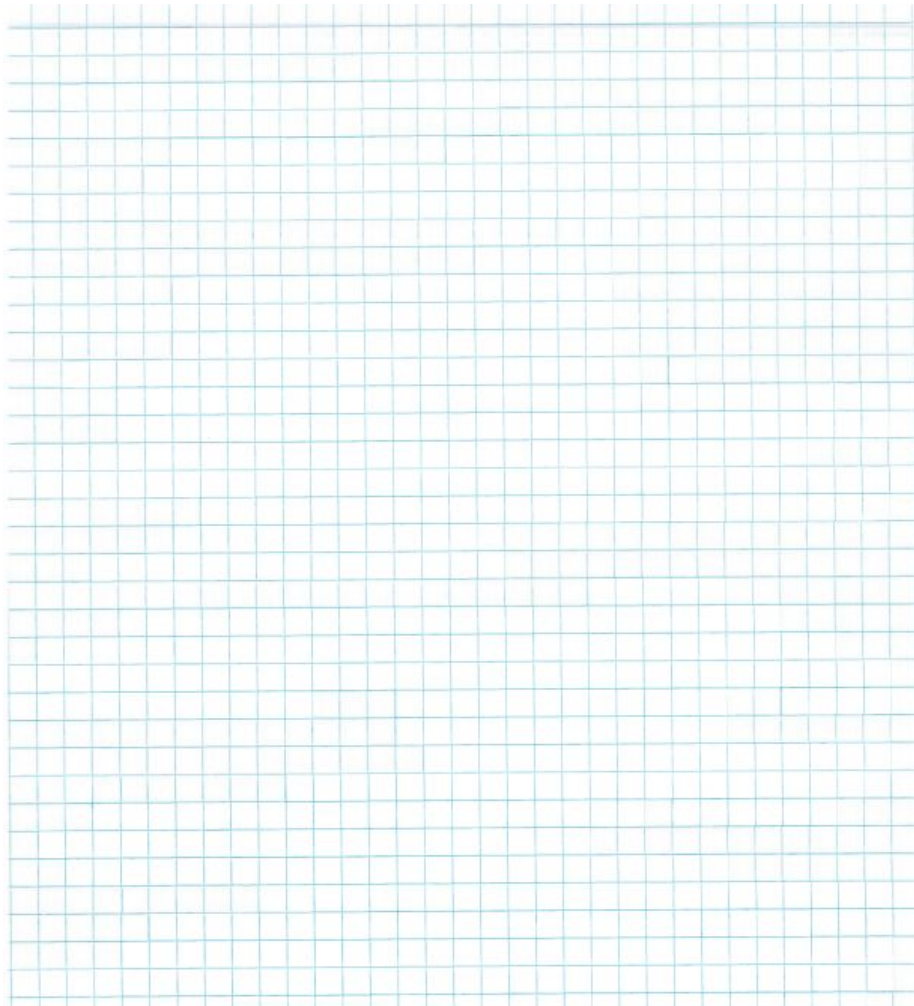
“I noticed _____, which connects to _____ because...”

Section 3: Honors Designation

8. Sketch a graph of the $k(x) = \frac{x^2+4x+3}{x+2}$ showing correct end behavior and intercepts. Be sure to show all work.

Work

Graph:



9. $H(x)$ is graphed to the right. Evaluate the following limits. Then, determine what limits correspond to which feature of rational functions. Lastly, explain why those limits correspond to that feature.

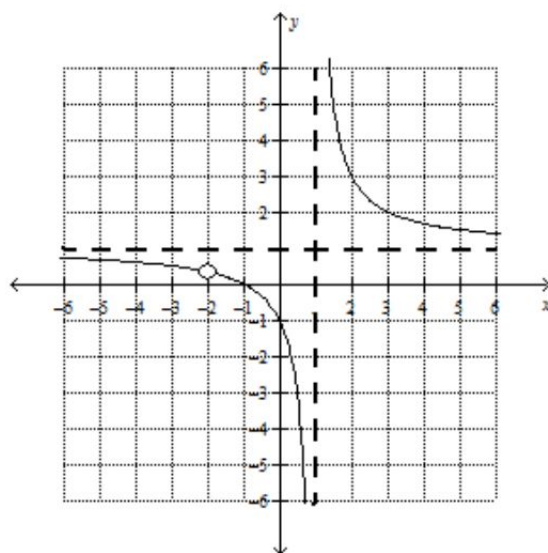
a. $\lim_{x \rightarrow -\infty} h(x) =$

b. $\lim_{x \rightarrow \infty} h(x) =$

c. $\lim_{x \rightarrow 1^-} h(x) =$

d. $\lim_{x \rightarrow 1^+} h(x) =$

e. $\lim_{x \rightarrow 1} h(x) =$



Limits	Feature of Rational Function	Explain how the limit connects to the feature. “_____ in the limit connects to _____ because ...”
a, b		
c, d, e		