Teacher Notes

1.1.3 How can I describe a function?

Function Investigation

As you investigate a new function today, you will completely describe graphs and explain how modifying the equation of the function changes its graph. As you work with your team, keep the multiple representations of functions in mind.

1-29.

Your team will investigate a function of the form $f(x) = \frac{1}{x-h}$. As a team, choose a value for h between −10 and 10. For example, if $h = 7$, then $f(x) = \frac{1}{x-7}$.

My teams function is: $f(x) = \frac{1}{x-}$ ← functions vary

ex. $f(x) = \frac{1}{x-3}$ ← $h=3$

1-30.

This function is different from others you have seen in the past. To get a complete graph, you will need to make sure your table includes enough information.

a. Make a table with integer x−values from 5 less than your value of h to 5 more than your value of h. For example, if you are working with $h = 7$, you would begin your table at $x = 2$ and end it at $x = 12$. What do you notice about all of your y−values?

b. Is there any x−value that has no y−value for your function? Why does your answer make sense?

c. Plot all of the points that you have in your table so far.

d. Now you will need to add more values to your table to see what happens to your function as your input values get close to your value of h. Choose eight input values that are very close to your value of h and on either side of h. For example, if you are working with $h = 7$, you might choose input values such as 6.5, 6.7, 6.9, 6.99, 7.01, 7.1, 7.3, and 7.5. For each new input value, calculate the corresponding output and add the new point to your graph.

e. When you have enough points to be sure that you know the shape of your graph, sketch the curve.

f. Fully describe the graph (using the attributes from problem 1-13).

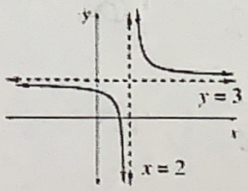
Math Notes:

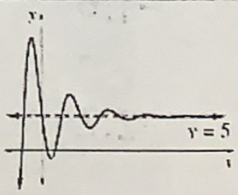
Asymptotes can be diagonal lines or even curves.

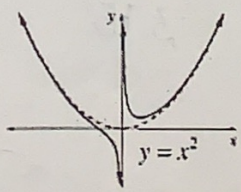
Horizontal Asymptotes: ←----------→
- → you can cross or touch (not always)
- → indicate general behavior

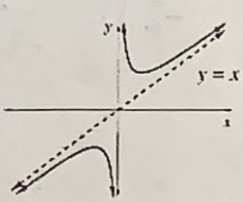
Vertical Asymptotes:
- → can NEVER touch
- → indicate specific behavior
- → graph approaches the asymptote

Look at the graphs below to see when some examples asymptotes occur. The dashed lines represent asymptotes.









1-31.

Now you will continue your investigation of $f(x) = \frac{1}{x-h}$.

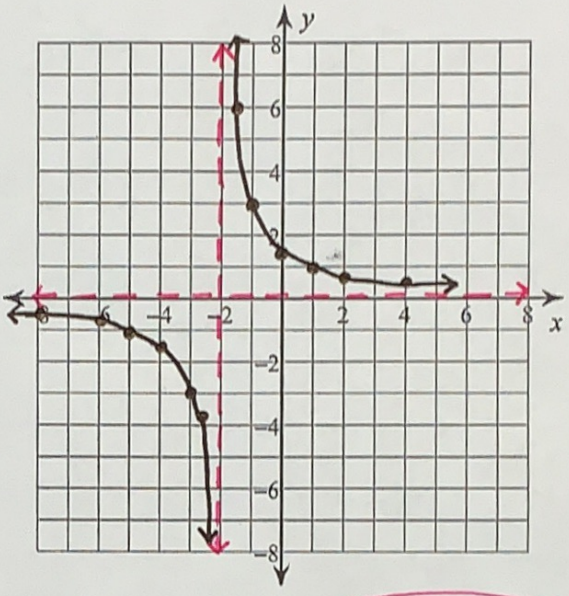
a. The graph of $f(x) = \frac{1}{x-h}$ has a vertical asymptote and a horizontal asymptote. To learn more about asymptotes, read the Math Notes box in this lesson. If you have not done so already, add the asymptotes as dashed lines to your graph, and write the equations of the asymptotes in your description of your function.

b. Since each function of the form $y = \frac{1}{x-h}$ has the same basic relationship between x and y, this set of functions c family of functions. The function $y = \frac{1}{x}$ (with $h = 0$), is called the parent function.

Example Rational Graph

$g(x) = \frac{3}{x+2}$ ← $h=-2$

x	work	y
-5	$\frac{3}{-5+2}$	-1
-4	$\frac{3}{-4+2}$	-1.5
-3	$\frac{3}{-3+2}$	-3
-1	$\frac{3}{-1+2}$	3
0	$\frac{3}{0+2}$	1.5
1	$\frac{3}{1+2}$	1
-1.8	$\frac{3}{-1.8+2}$	15
-1.5	$\frac{3}{-1.5+2}$	6
-2.2	$\frac{3}{-2.2+2}$	-15
-2.8	$\frac{3}{-2.8+2}$	-3.75



- increasing or decreasing?
- x-int: none
- y-int: (0, 1.5)
- Domain: $x \neq -2$
- Range: $y \neq 0$
- endpoints: none
- max/min: none
- continuous or discrete?
- function? yes!
- vertical asymptote: $x = -2$
- horizontal asymptote: $y = 0$