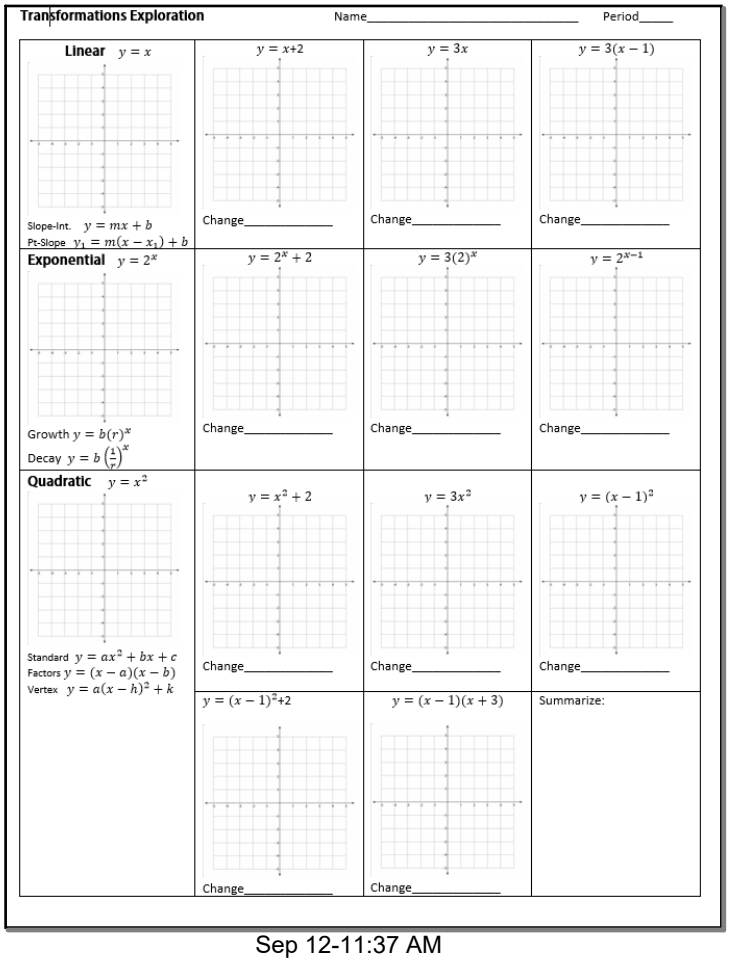

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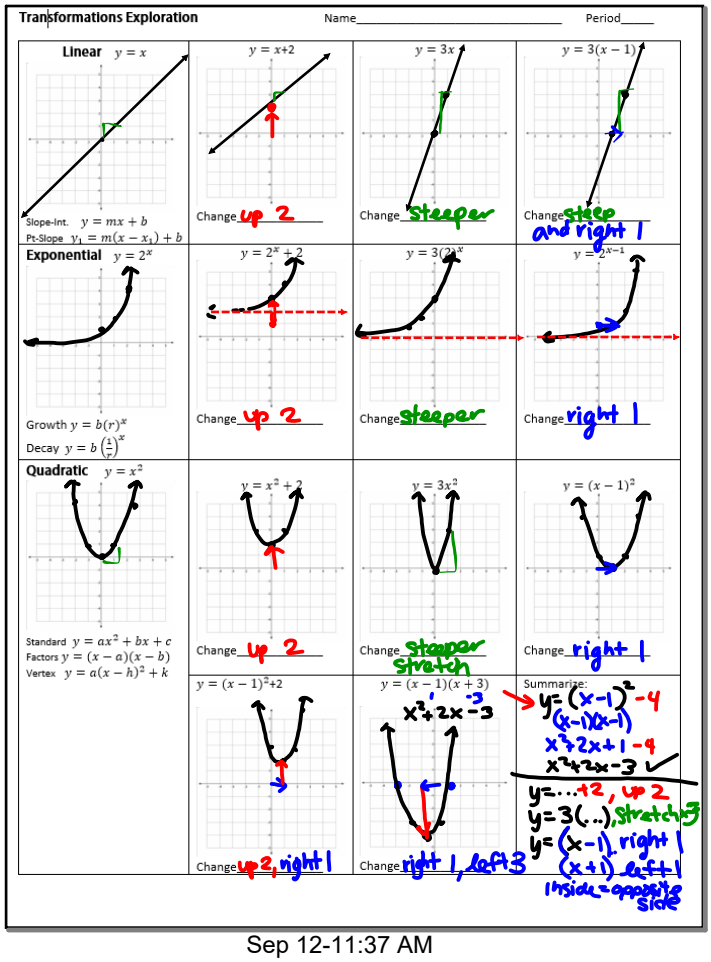

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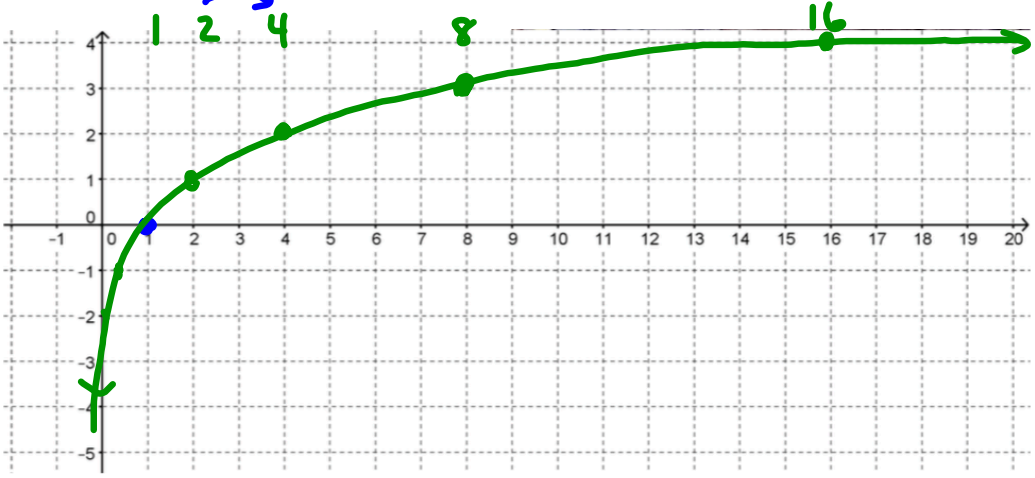
2.2 Falling Off A Log

A Solidify Understanding Task

1. Construct a table of values and a graph for each of the following functions. Be sure to select at least two values in the interval $0 < x < 1$.

a) $f(x) = \log_2 x$

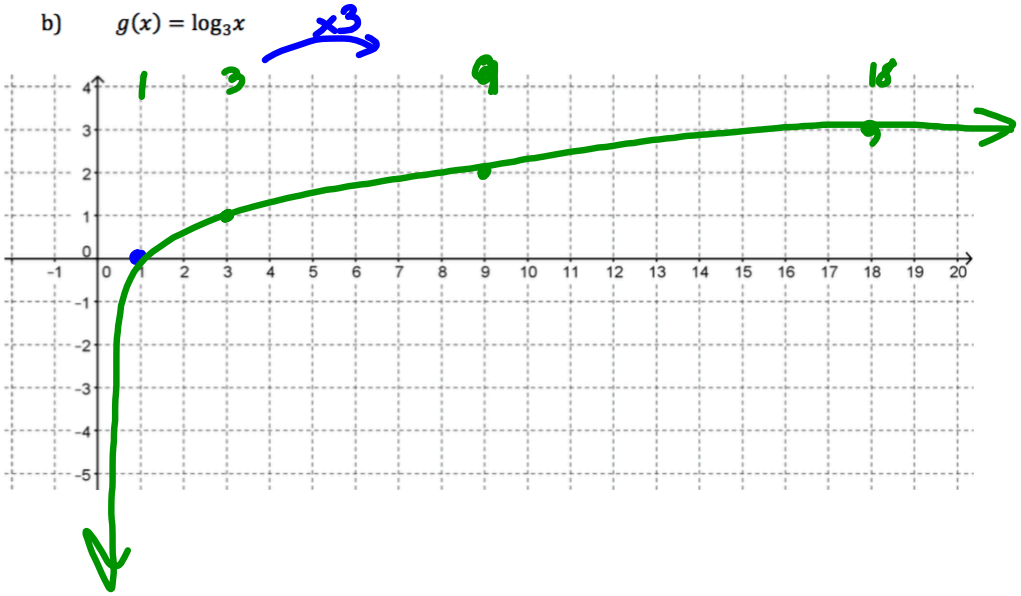
x	2^x
-3	1/8
-2	1/4
-1	1/2
0	1
1	2
2	4
3	8



Mar 28-10:17 AM

b) $g(x) = \log_3 x$

x	3^x
-2	1/9
-1	1/3
0	1
1	3
2	9



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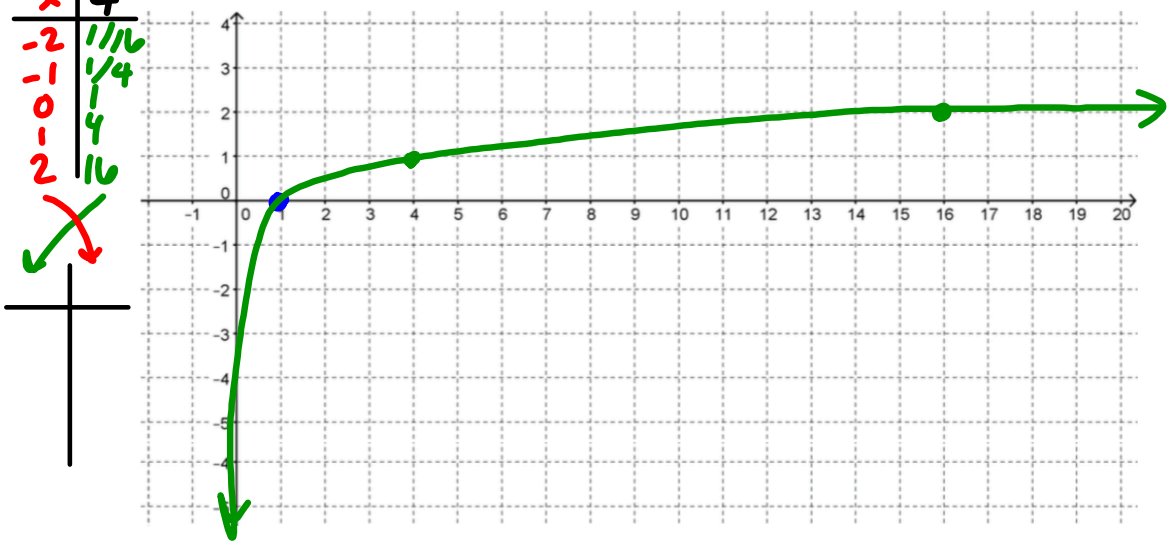
c) $h(x) = \log_4 x$

x	4^x
-2	1/16
-1	1/4
0	1
1	4
2	16



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2. How did you decide what values to use for x in your table?

Use exponential equation's table and switch.

3. How did you use the x values to find the y values in the table?

x | 2^x x

4. What similarities do you see in the graphs?

All have an asymptote @ $x=0$
All are exponentials, but sideways

5. What differences do you observe in the graphs?

different rates x2, x3, x4
double triple Quadruple

6. What is the effect of changing the base on the graph of a logarithmic function?

rate of change / speed to the side
x direction

Mar 28-10:24 AM

a) Let's focus now on $k(x) = \log_{10} x$ so that we can use technology to observe the effects of changing parameters on the function. Because base 10 is a very commonly used base for exponential and logarithmic functions, it is often abbreviated and written without the base, like this: $k(x) = \log x$.

b) Use technology to graph $y = \log x$. How does the graph compare to the graph that you constructed?

Desmos Graphing Interactive

Click here

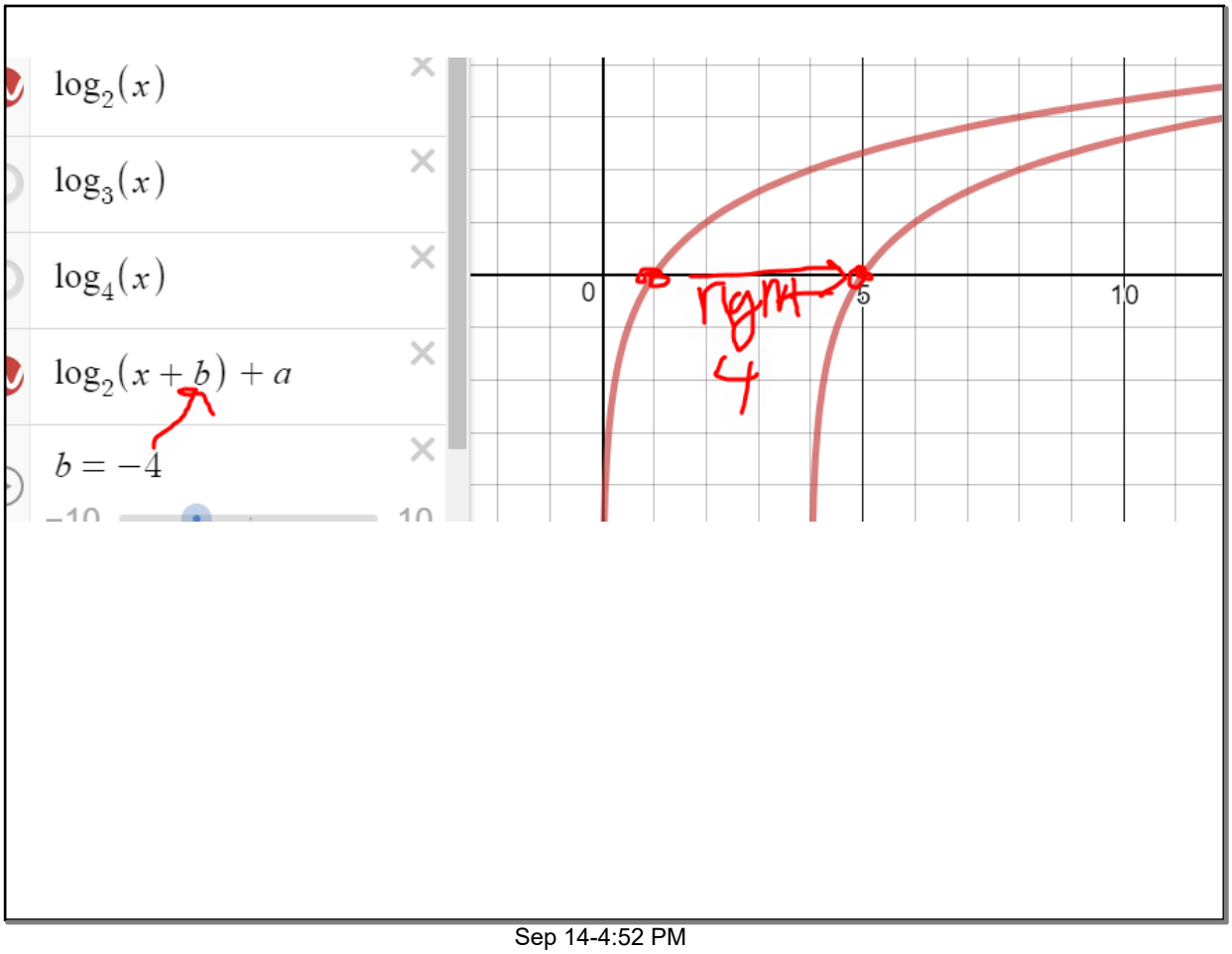
e) How do you predict that the graph of $y = a + \log x$ will be different from the graph of $y = \log x$?

f) Test your prediction by graphing $y = a + \log x$ for various values of a. What is the effect of a? Make a general argument for why this would be true for all logarithmic functions.

up & down shifts

Mar 28-10:30 AM

Sep 14-12:24 PM



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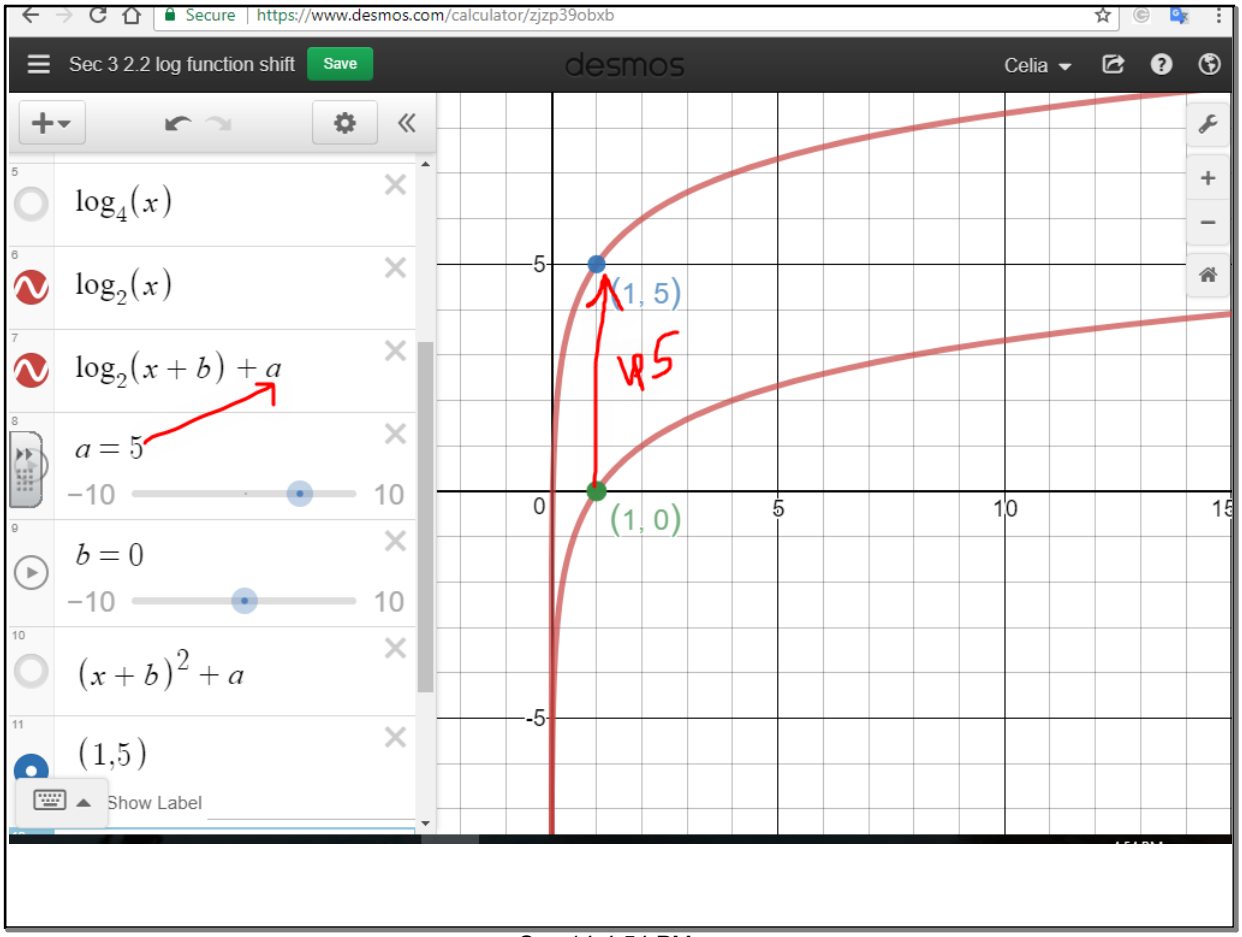


Sep 14-4:54 PM

g) How do you predict that the graph of $y = \log(x + b)$ will be different from the graph of $y = \log x$?

h) Test your prediction by graphing $y = \log(x + b)$ for various values of b.

- What is the effect of adding b?

x-direction, side to side

left

- What will be the effect of subtracting b?

right

- Make a general argument for why this is true for all logarithmic functions.

$y = \log_r(x - b) + a$

r: rate, multiplies by to the side

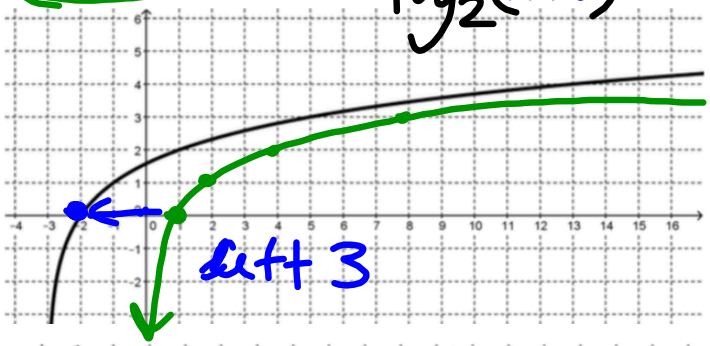
$-b$: +left, −right

$+a$: up, down

Mar 28-10:31 AM

7. Write an equation for each of the following functions that are transformations of $f(x) = \log_2 x$.

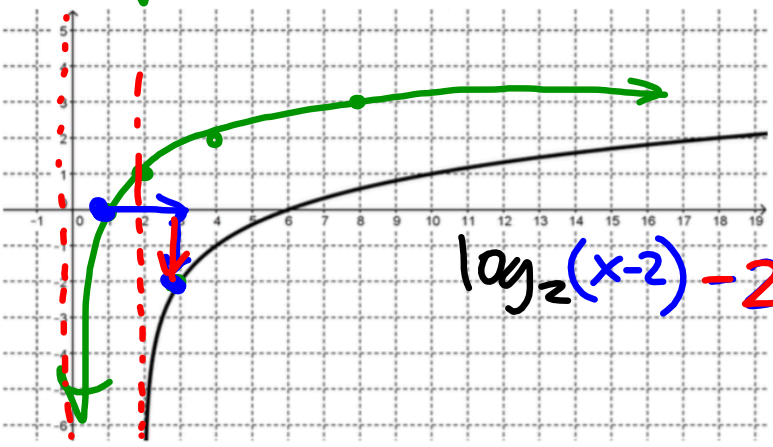
a.



$\log_2(x+3)$

left 3

b.

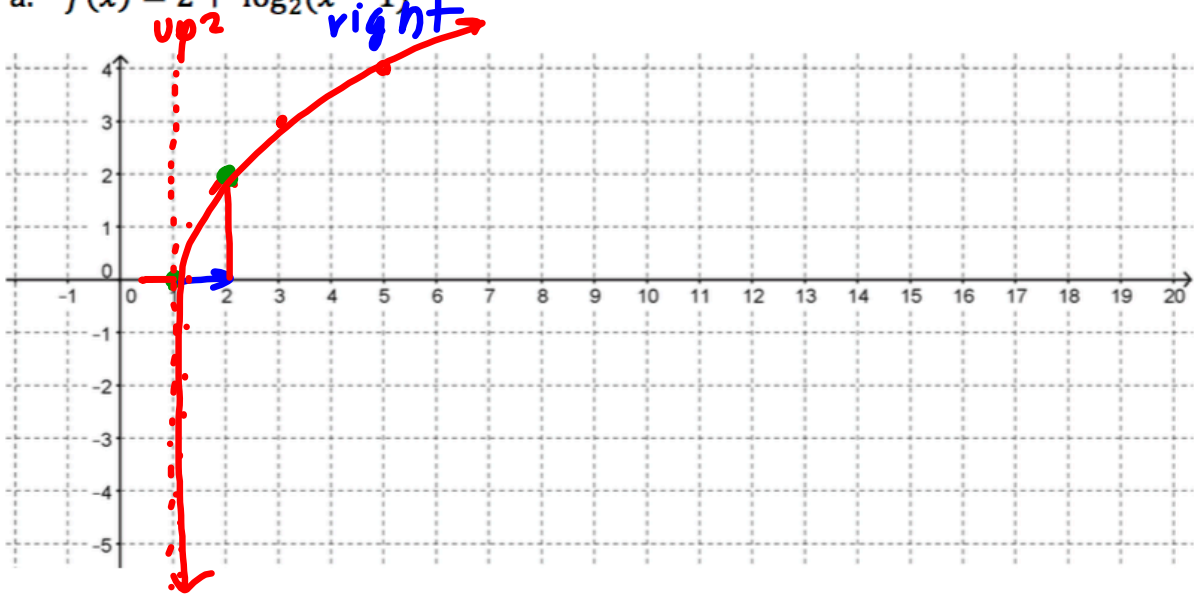


$\log_2(x-2) - 2$

Mar 28-10:32 AM

8. Graph and label each of the following functions:

a. $f(x) = 2 + \log_2(x - 1)$



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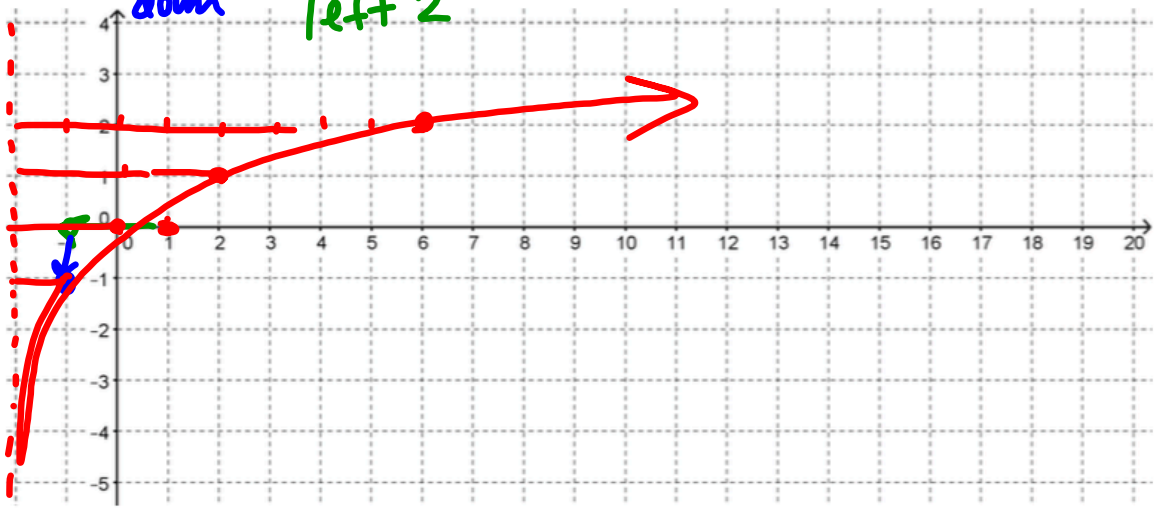
b. $g(x) = -1 + \log_2(x + 2)$



9. Compare the transformation of the graphs of logarithmic functions with the transformation of the graphs of quadratic functions.

Mar 28-10:33 AM

Name Logarithmic Functions 2.2

Ready, Set, Go!

Ready

Topic: Solving simple logarithmic equations

Find the answer to each logarithmic equation. Then explain how each equation supports the statement, *"The answer to a logarithmic equation is always the exponent."*

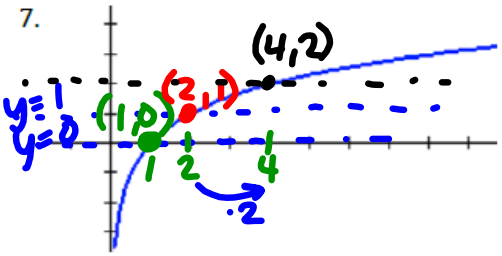
1. $log_5 625 =$ $5^4 = 625$
2. $log_3 243 =$
3. $log_5 0.2 =$
4. $log_9 81 =$
5. $log 1{,}000{,}000 =$
6. $log_x x^7 =$

Sep 14-4:38 PM

Set Topic: Transformations on logarithmic functions

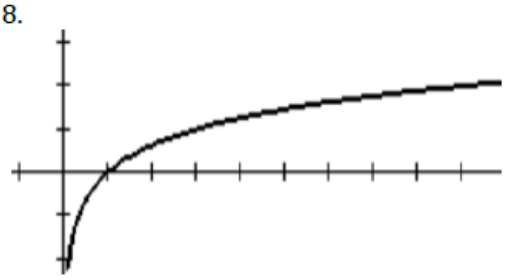
Answer the questions about each graph. (You may want to use a straightedge to find $f(x)$.

7.



a. What is the value of x when $f(x) = 0$? $y=0$ $x=1$
b. What is the value of x when $f(x) = 1$? $x=2$
c. What is the value of $f(x)$ when $x = 2$?
d. What will be the value of x when $f(x) = 4$?
e. What is the equation of this graph? $\log_2 x$

8.

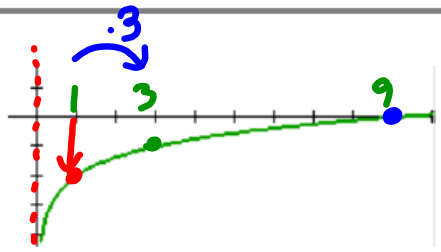


f. What is the value of x when $f(x) = 0$?
g. What is the value of x when $f(x) = 1$?
h. What is the value of $f(x)$ when $x = 9$?
i. What will be the value of x when $f(x) = 4$?
j. What is the equation of this graph?

Sep 14-4:40 PM

Name Logarithmic Functions 2.2

9.



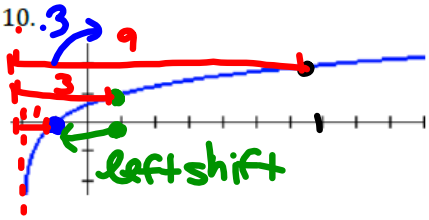
Use the graph and the table of values for the graph to write the equation of the graph.

Explain which numbers in the table helped you the most to write the equation.

X	Y_1
1	-2
2	-1.369
3	-1
5	-.535
7	-.2288
9	0

The whole numbers were easy to see on the graph $\log_3 x - 2$

10.



Use the graph and the table of values for the graph to write the equation of the graph.

Explain which numbers in the table helped you the most to write the equation.

X	Y_1
-2	ERROR
-1	0
0	.63093
1	1
5	1.7712
6	1.8928
7	2

error → asymptote
whole numbers → points
$\log_3(x+2)$

Sep 14-4:41 PM

Go Topic: Power to a power rule with exponents

$(x^a)^b = x^{a \cdot b}$ $(ab)^x = a^x b^x$

Simplify each expression. Answers should have only positive exponents.

11. $(2^3)^4$ 2^{12}

12. $(x^3)^2$

13. $(a^3)^{-2}$

14. $(2^3w)^4$

15. $(b^{-7})^3$

16. $(d^{-3})^{-2}$

17. $x^2 \cdot (x^5)^2$

18. $m^{-3} \cdot (m^2)^3$ $m^{-3} \cdot m^6 = \frac{m^6}{m^3} = m^3$

19. $(x^5)^{-4} \cdot x^{25}$

20. $(5a^3)^2$ $5^2 a^6$ $25a^6$

21. $(6^{-3})^2$

22. $(2a^3b^2)^2$

Sep 14-4:41 PM