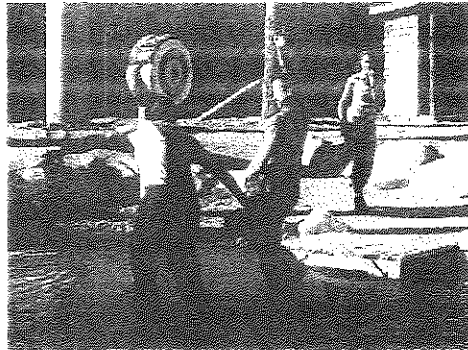


2.2 Falling Off a Log

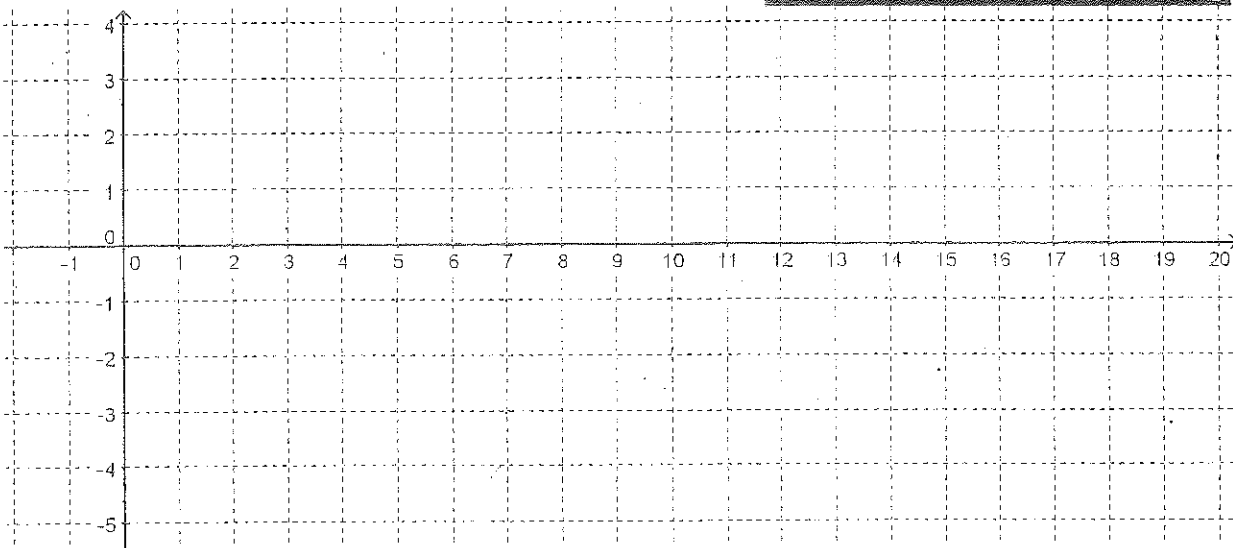
A Solidify Understanding Task



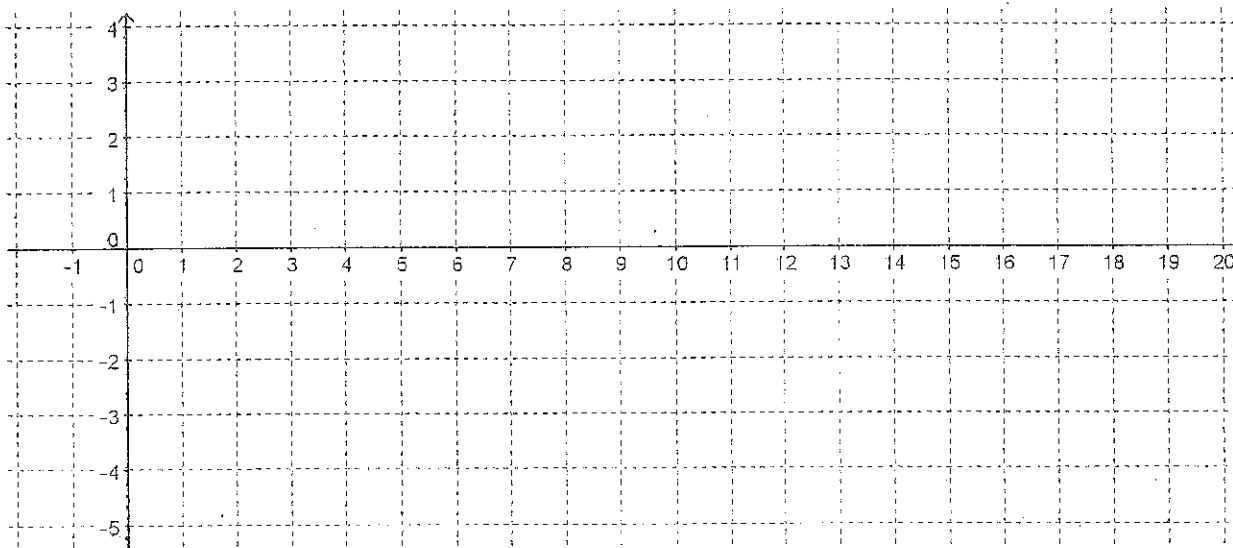
CC BY Ruth Hartnup
<https://iitc.kr/p/35Lhxq>

- 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 $0 < x < 1$.

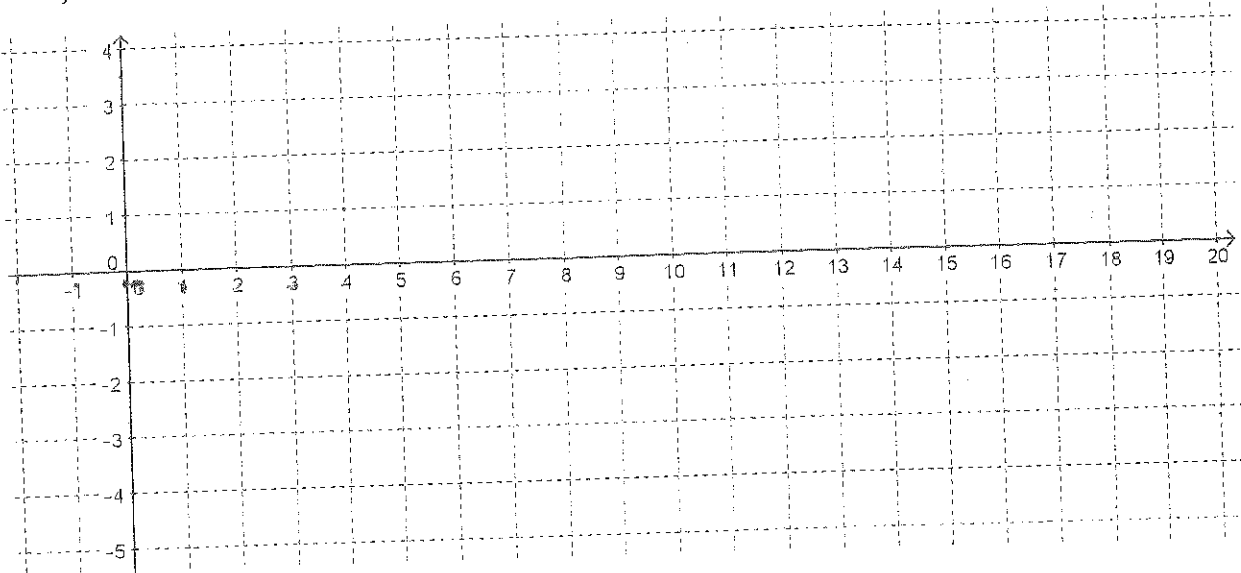
a) $f(x) = \log_2 x$



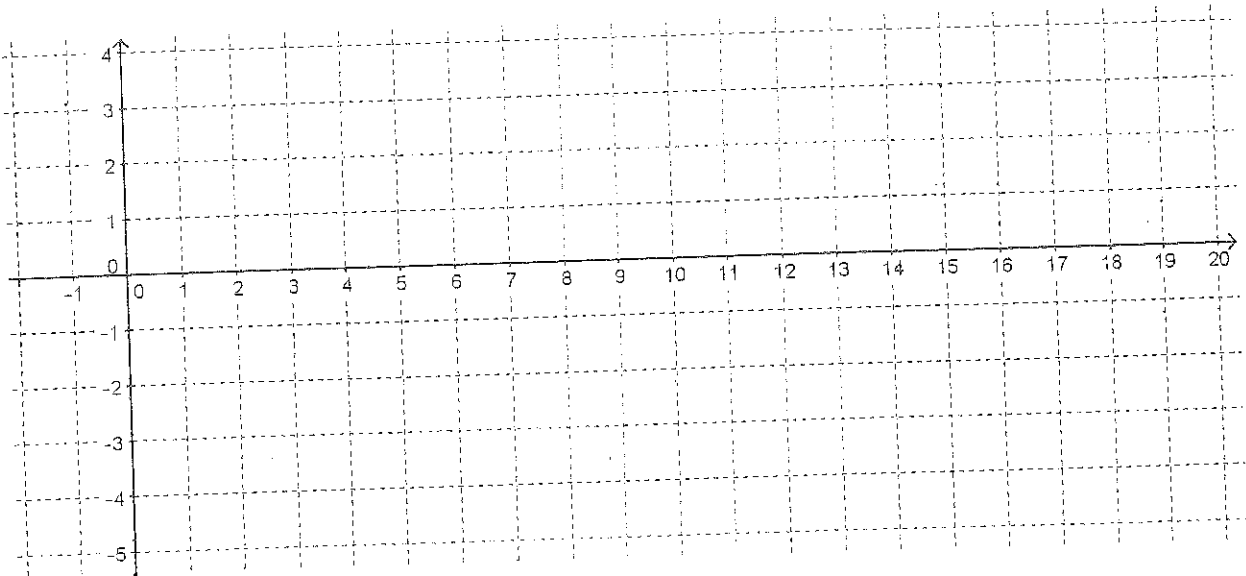
b) $g(x) = \log_3 x$



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



d) $k(x) = \log_{10} x$



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

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

4. What similarities do you see in the graphs?
5. What differences do you observe in the graphs?
6. What is the effect of changing the base on the graph of a logarithmic function?

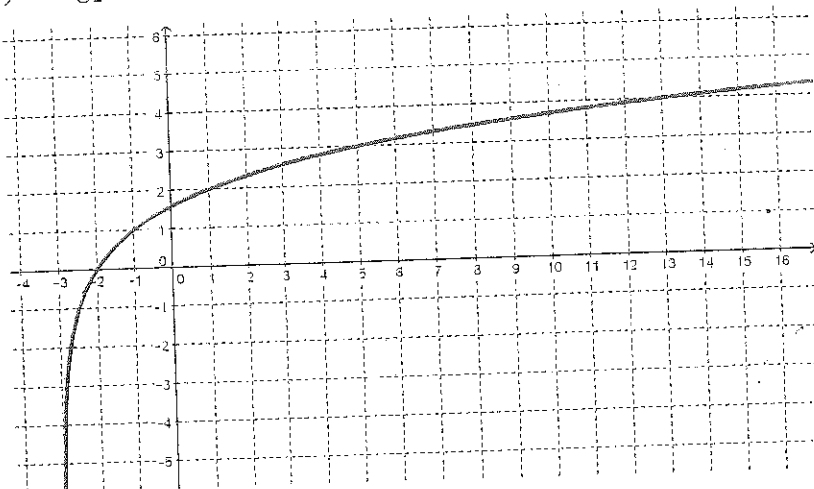
Let's focus now on $k(x) = \log_{10}x$ so that we can use technology to observe the effects of changing parameters on the function. **Because base 10 is a very commonly used base for exponential and logarithmic functions, it is often abbreviated and written without the base, like this:**
 $k(x) = \log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

7. Use technology to graph $y = \log x$. How does the graph compare to the graph that you constructed?
8. How do you predict that the graph of $y = a + \log x$ will be different from the graph of $y = \log x$?
9. Test your prediction by graphing $y = a + \log x$ for various values of a . What is the effect of a on the graph? Make a general argument for why this would be true for all logarithmic functions.
10. How do you predict that the graph of $y = \log(x + b)$ will be different from the graph of $y = \log x$?

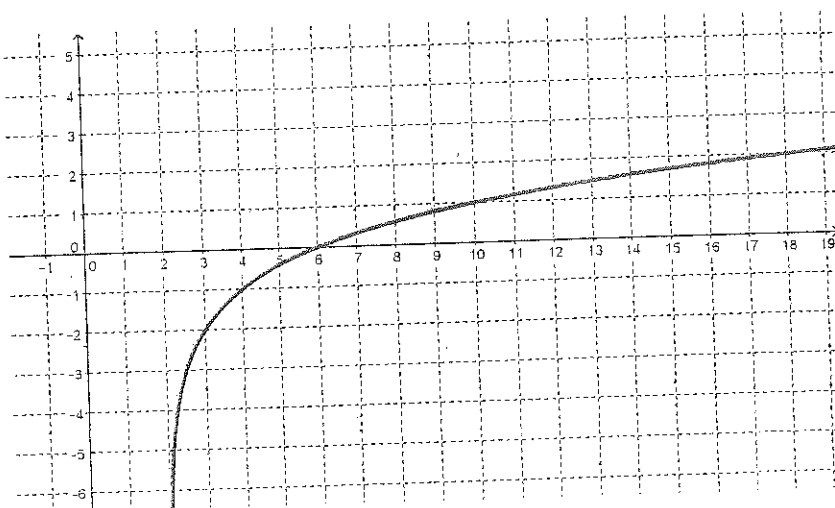
11. Test your prediction by graphing $y = \log(x + b)$ for various values of b .
- What is the effect of adding b ?
 - What will be the effect of subtracting b (or adding a negative number)?
 - Make a general argument for why this is true for all logarithmic functions.

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

a.

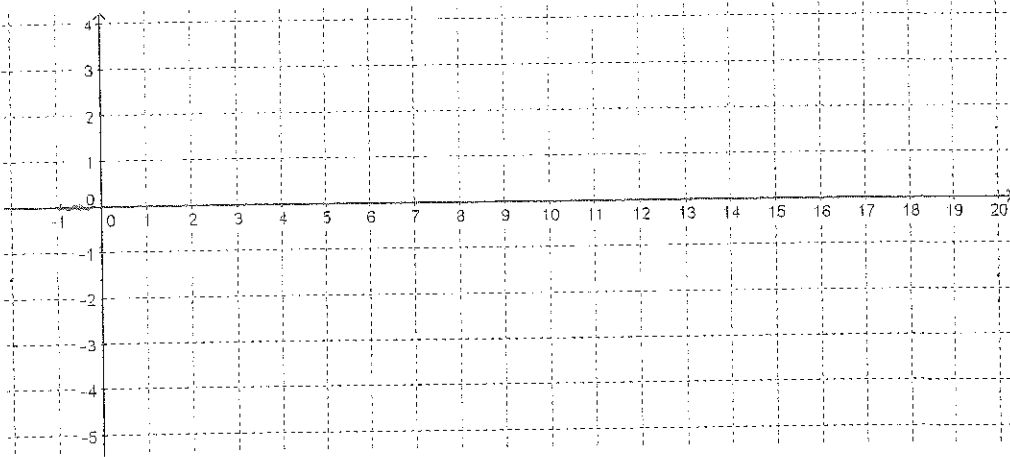


b.

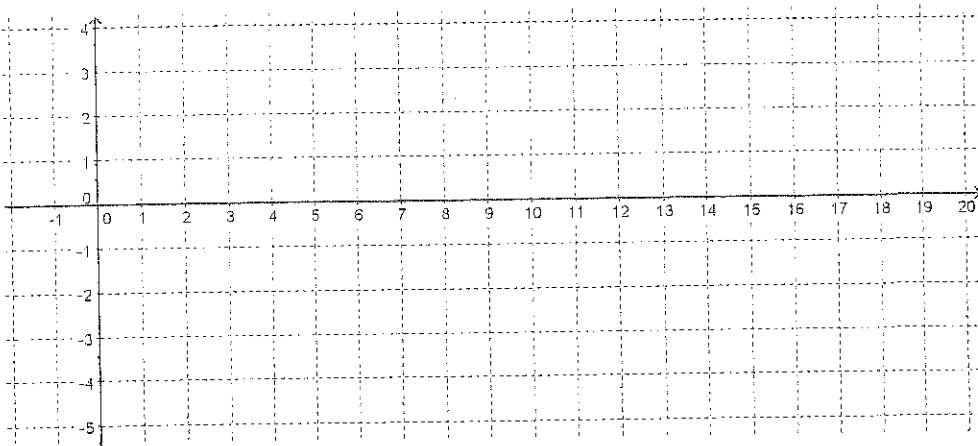


13. Graph and label each of the following functions:

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



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



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

READY, SET, GO!

Name _____

Period _____

Date _____

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. $\log_5 625 =$

2. $\log_3 243 =$

3. $\log_5 0.2 =$

4. $\log_9 81 =$

5. $\log 1,000,000 =$

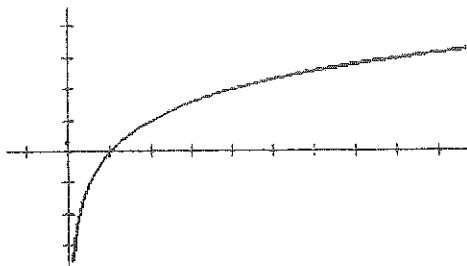
6. $\log_x x^7 =$

SET

Topic: Exploring transformations on logarithmic functions

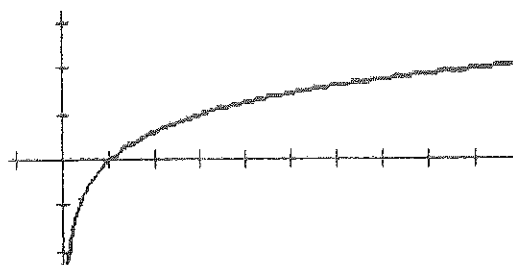
Answer the questions about each graph.

7.



- What is the value of x when $f(x) = 0$?
- What is the value of x when $f(x) = 1$?
- What is the value of $f(x)$ when $x = 2$?
- What will be the value of x when $f(x) = 4$?
- What is the equation of this graph?

8.

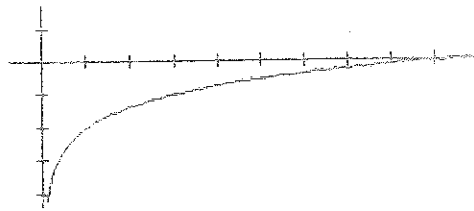


- What is the value of x when $f(x) = 0$?
- What is the value of x when $f(x) = 1$?
- What is the value of $f(x)$ when $x = 9$?
- What will be the value of x when $f(x) = 4$?
- What is the equation of this graph?

Need help? Visit www.rsgsupport.org

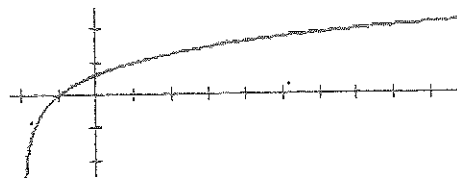


9. Use the graph and the table of values for the graph to write the equation of the graph. Explain which numbers in the table helped you the most to write the equation.



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

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

GO

Topic: Using the power to a power rule with exponents

Simplify each expression. Answers should have only positive exponents.

11. $(2^3)^4$ 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. $m^{-3} \cdot (m^2)^3$
19. $(x^5)^{-4} \cdot x^{25}$ 20. $(5a^3)^2$ 21. $(6^{-3})^2$ 22. $(2a^3b^2)^2$

Need help? Visit www.rsgsupport.org