



Algebra 2 Workbook

Exponential and logarithmic functions

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MATH

WHAT IS A LOGARITHM?

- 1. How would you read the logarithmic equation out loud?

$$\log_7 57 = y$$

- 2. Rewrite the equation in logarithmic form.

$$64^{\frac{1}{2}} = 8$$

- 3. Rewrite the equation in exponential form.

$$\log_u \frac{19}{20} = v$$

- 4. Use the general log rule to solve for x .

$$\log_5(125) = x$$

- 5. Use the general log rule to solve the logarithm.

$$\log_{64} 8 = x$$



■ 6. Write the logarithm that answers this question: To what power do you have to raise 289 in order to get 17?



COMMON BASES AND RESTRICTED VALUES

- 1. Is there something wrong with the logarithm? If so, what is it?

$$\log_{-5}(8)$$

- 2. Is there something wrong with the logarithm? If so, what is it?

$$\log_5(-8)$$

- 3. Is the following statement true or false? Why?

$$\log 5 = \log_{10} 5$$

- 4. How else can you write $\log_e 7$?

- 5. Solve the logarithm for x .

$$\log(10,000) = x$$

- 6. Solve the logarithm for x .



$$\ln(e^5) = x$$



EVALUATING LOGS

- 1. Find the exact value of the logarithm.

$$\log_3 27$$

- 2. Find the exact value of the logarithm.

$$\log_9 \frac{1}{81}$$

- 3. Find the value given by the log.

$$\log_{7,776} 6$$

- 4. Find the exact value of the logarithm.

$$\log_{343} 7$$

- 5. Find the exact value of the logarithm.

$$\log_4(1,024)$$



- 6. Find the exact value of the logarithm.

$$\log_{64} \frac{1}{4}$$



THE GENERAL LOG RULE

■ 1. Write the inverse of the log function.

$$\log y = 2x$$

■ 2. Write the inverse of the log function.

$$\ln y = x$$

■ 3. The table shows points that satisfy an exponential function. Write a set of four points that will satisfy its inverse.

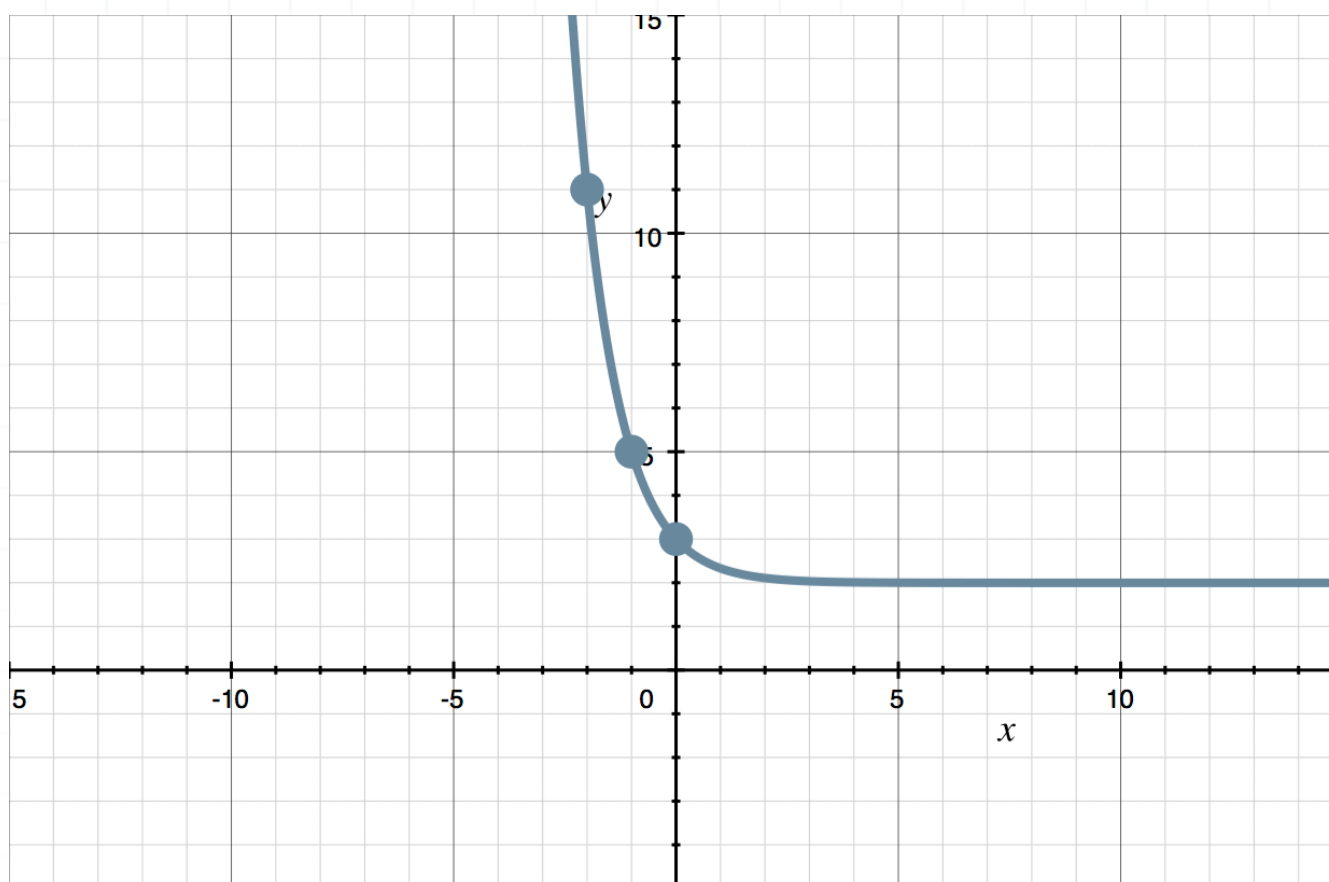
x	1	2	3	4
y=a ^x	1.5	2.25	3.375	5.0625

■ 4. The table shows points that satisfy a logarithmic function. Write a set of four points that will satisfy its inverse.

x	10	100	1,000	10,000
y=log(x)	1	2	3	4

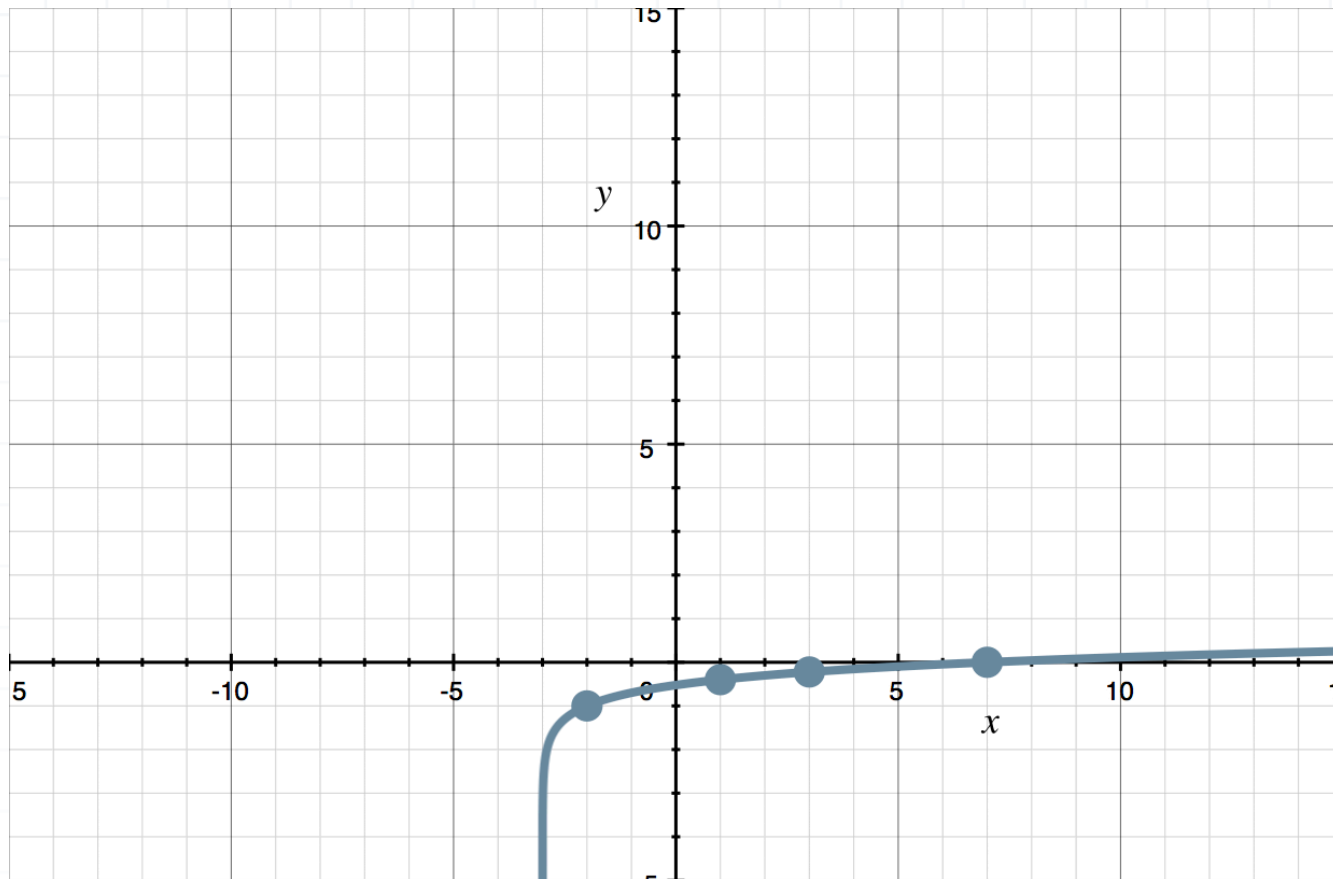


- 5. The graph shown passes through $(-2, 11)$, $(-1, 5)$, and $(0, 3)$. Sketch the graph of its inverse.



- 6. The graph shown passes through $(-2, -1)$, $(1, -0.3979)$, $(3, -0.2218)$, and $(7, 0)$. Sketch the graph of its inverse.





LAWS OF LOGARITHMS

- 1. Write the expression as a single logarithm. Solve if possible.

$$\log_2 2 + \log_2 4$$

- 2. Write the expression as a single logarithm. Solve if possible.

$$\log_3 216 - \log_3 24$$

- 3. Write the expression as a single logarithm. Solve if possible.

$$\log_4 10 - 3 \log_4 2$$

- 4. Write the expression as a single logarithm. Solve if possible.

$$2 \log_7 4 + 3 \log_7 5$$

- 5. Solve the equation.

$$\log_a 2 + \log_a 4 = \log_a (x + 2)$$



■ 6. Solve the equation.

$$\log_4(x + 5) - \log_4(x - 2) = \log_4 3$$

■ 7. Solve the equation.

$$2 \log_b x = \log_b 49$$

■ 8. Solve the equation.

$$\log_{12} x = \frac{3}{2} \log_{12} 16$$



CHANGE OF BASE

- 1. Find the log to four decimal places.

$$\log_3 6$$

- 2. Find the log to four decimal places.

$$\log_5 8$$

- 3. Find the approximate solution to the logarithm to the nearest ten thousandth.

$$\log_6 40$$

- 4. Write the log expression in terms of natural logs.

$$\log_4 6.7$$

- 5. Find the exact value of the logarithmic expression.

$$\frac{\ln(16,807)}{\ln(7)}$$



- 6. Use logarithms to solve the equation to the nearest ten thousandth.

$$8 \cdot 6^{3x} = 4,104$$



LAWS OF NATURAL LOGS

- 1. Condense the expression into a single logarithm.

$$2 \ln 2 - 3 \ln 4$$

- 2. Condense the expression into a single logarithm.

$$\frac{5 \ln 2}{4}$$

- 3. Condense the expression into a single logarithm.

$$3(\ln 2x - \ln 5) + (\ln 4 - \ln 3y)$$

- 4. Expand the logarithm.

$$\ln (3 \cdot 5)^4$$

- 5. Expand the logarithm.

$$\ln \left(\frac{4}{5} \right)^2$$



■ 6. Expand the logarithm.

$$\ln(3xy^2)$$



GRAPHING EXPONENTIAL FUNCTIONS

- 1. Will the function have a vertical or horizontal asymptote? Where is it located? What is the end behavior of the function?

$$y = \left(\frac{1}{3}\right)^{x-2} + 3$$

- 2. Will the function have a vertical or horizontal asymptote? Where is it located? What is the end behavior of the function?

$$x = -4^{y+3} - 2$$

- 3. What is the coordinate of the y -intercept of the function?

$$y = \left(\frac{1}{8}\right)^x + 2$$

- 4. What is the x -intercept of the function?

$$x = \left(\frac{11}{8}\right)^y - 4$$



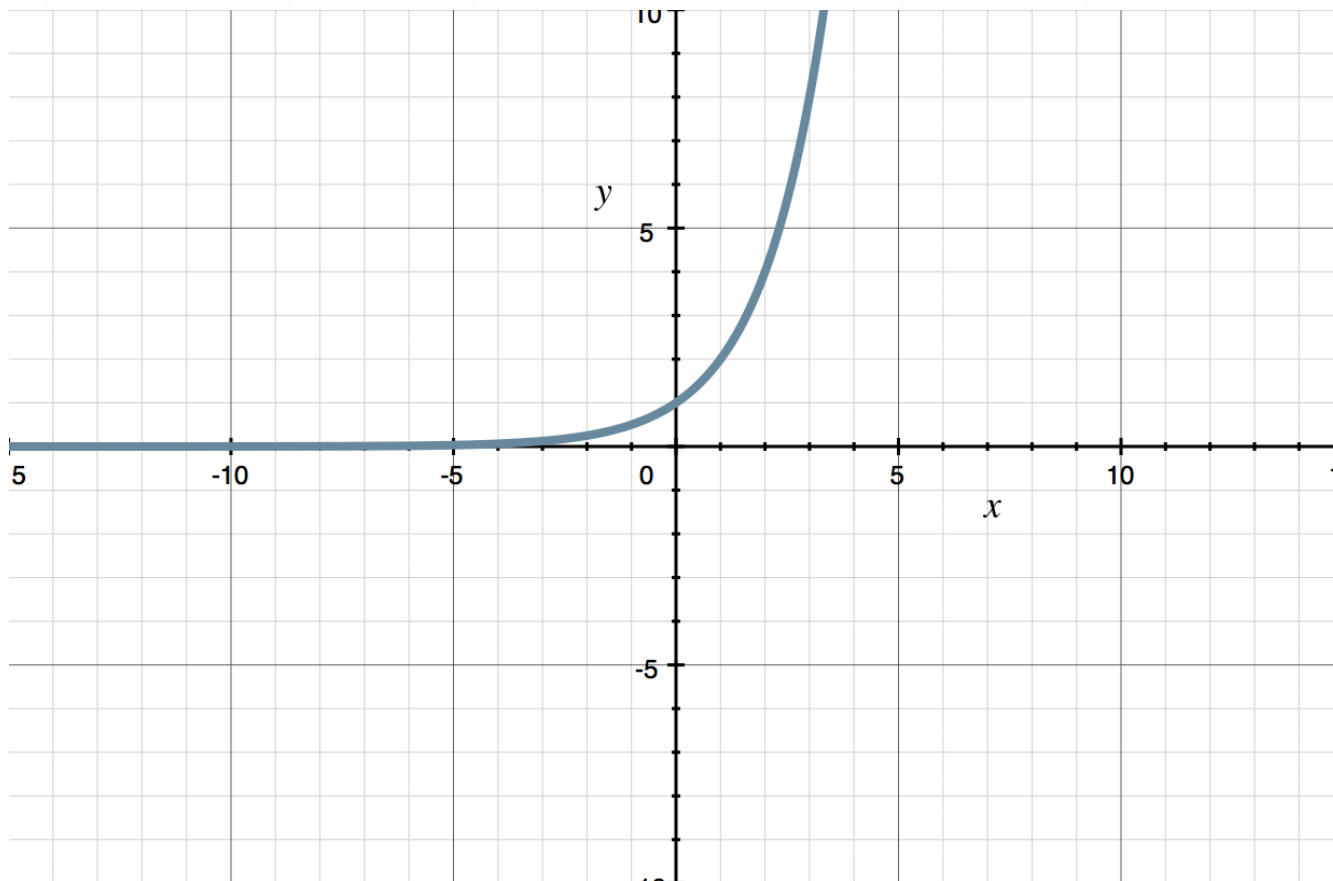
- 5. Sketch the graph of the function by finding the y -intercept and figuring out the function's end behavior.

$$y = -2^{x+1} - 5$$

- 6. Sketch the graph of the function using the x -intercept and the end behavior.

$$x = \left(\frac{1}{4}\right)^{y+2} - 2$$

- 7. Given the graph of $y = 2^x$, use transformations to graph $y = 2^{x-1} + 4$.



GRAPHING LOG FUNCTIONS

- 1. Will the function have a vertical or horizontal asymptote? Where is it located?

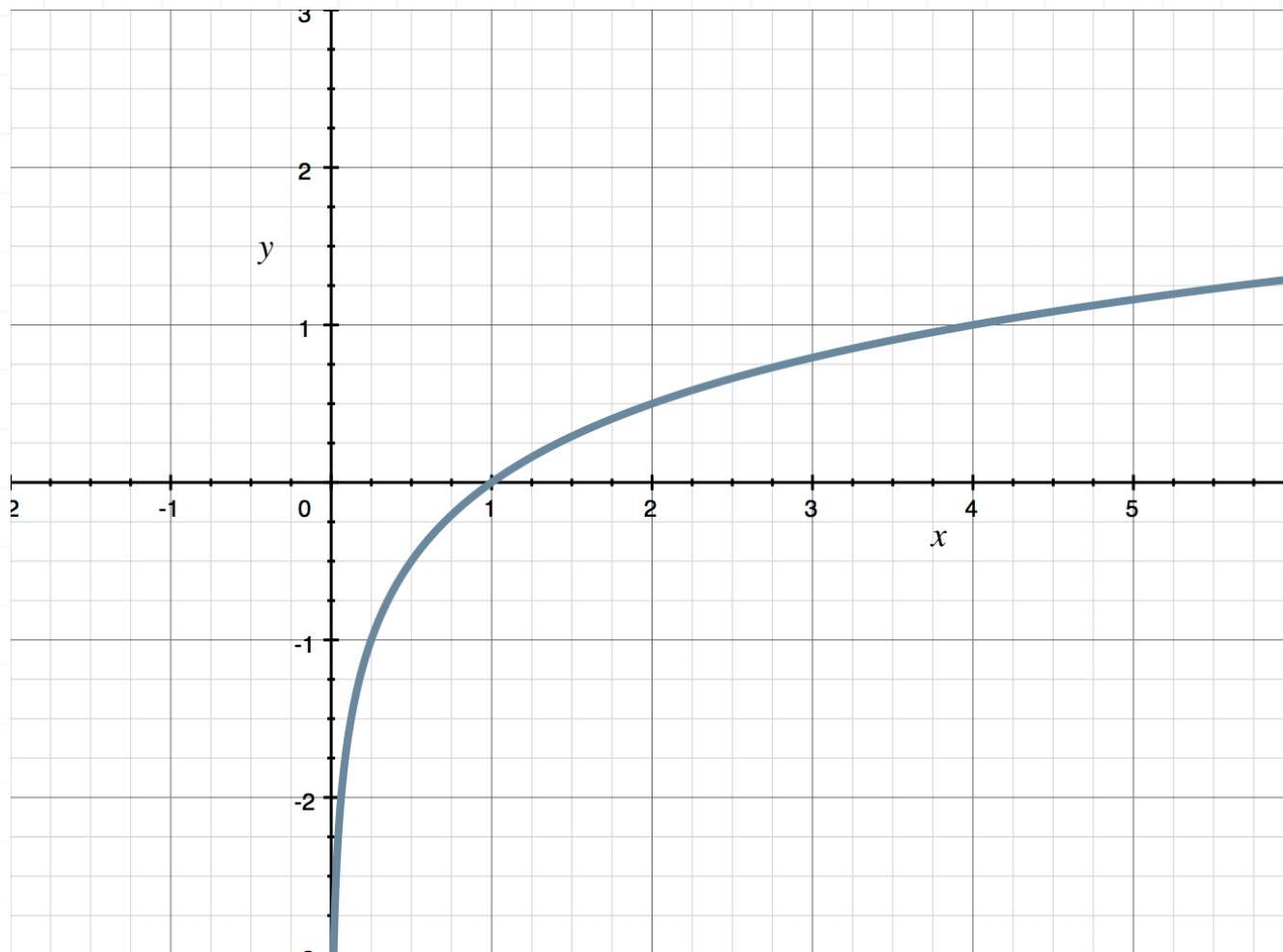
$$y = \log_2(x - 1)$$

- 2. Will the function have a vertical or horizontal asymptote? Where is it located?

$$y = \log_4(2x) + \log_4(3)$$

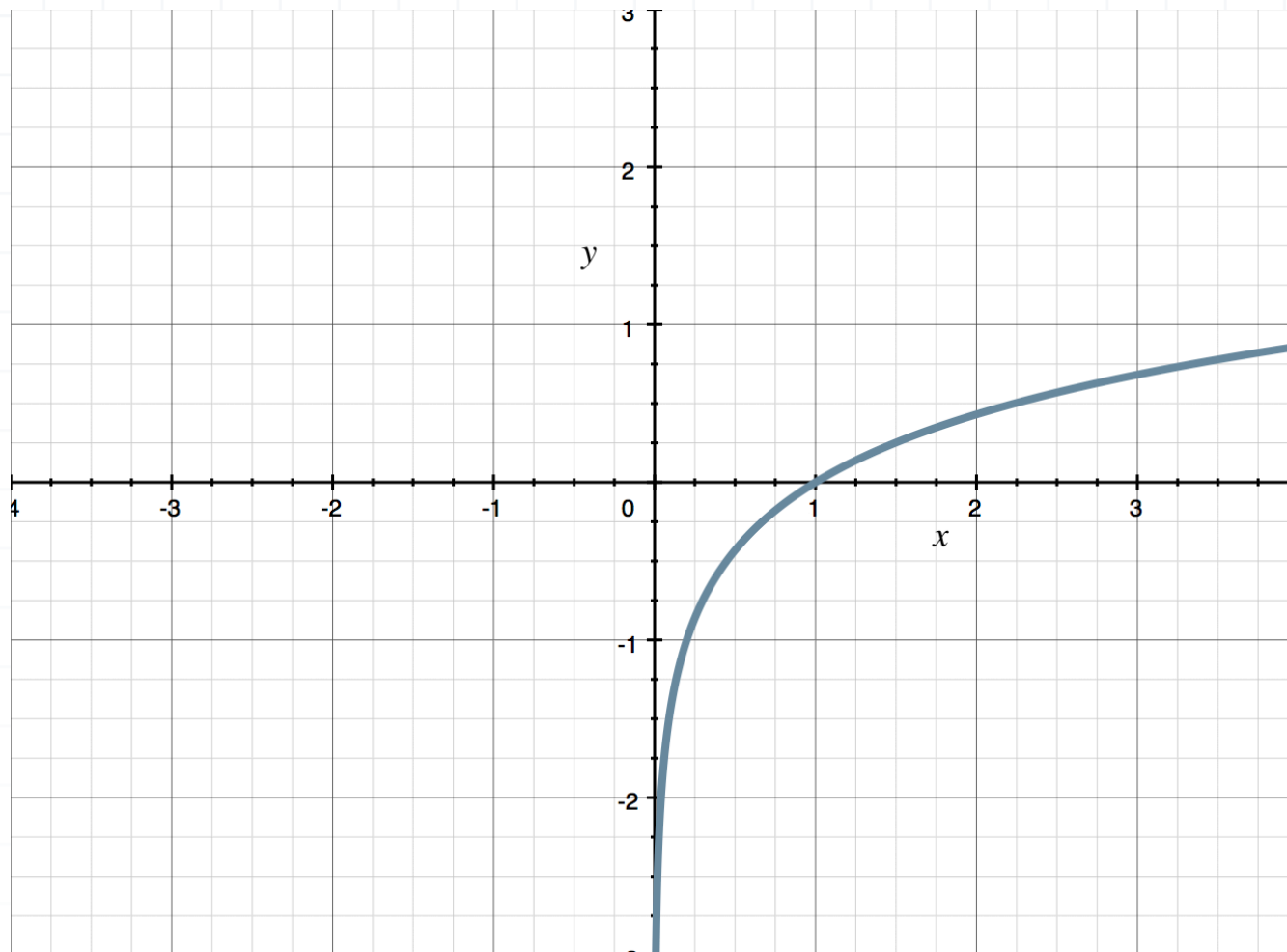
- 3. Given the graph of $y = \log_4(x)$, use transformations to sketch the graph of $y = \log_4(x - 2) - 3$.





- 4. Given the graph of $y = \log_5(x)$, use transformations to sketch the graph of $y = -\log_5(x + 1) + 2$.





- 5. Sketch the graph of the function by making a table of values.

$$y = \log_5 x$$

- 6. Sketch the graph of the function using intercepts and end behavior.

$$x = 2\log_3(y + 1)$$



