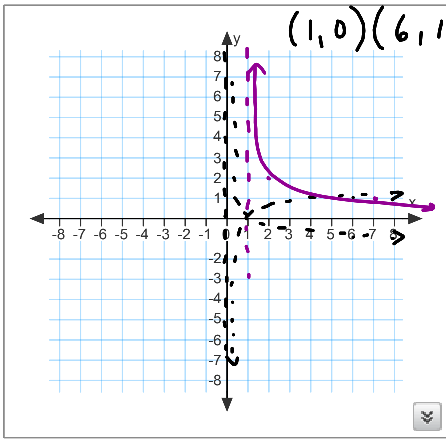
Warm up

Sketch by hand.

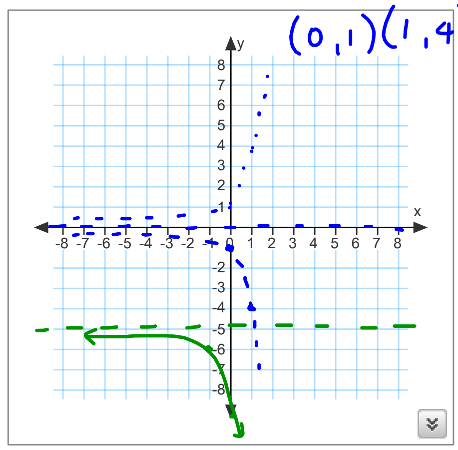
1. $y = -\log_6(x-1)+2$ $\log_6(-x-1)+2$ $(-(x+1))+2$

2. $y = -4^{x+1} - 5$

(1,0)(6,1)



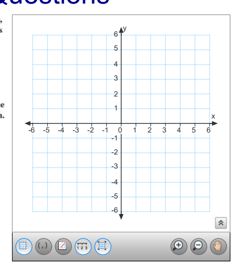
(0,1)(1,4)



Nov 1-6:52 AM

GO COUGARS!

p 204 **Homework Questions**



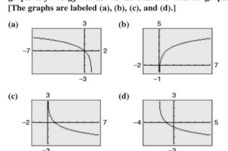
In Exercises 47–52, find the domain, vertical asymptote, and x-intercept of the logarithmic function, and sketch its graph by hand.

47. $y = \log_2(x+2)$ **48.** $y = \log_2(x-1)$

49. $y = 1 + \log_2 x$ **50.** $y = 2 - \log_2 x$

51. $y = 1 + \log_2(x-2)$ **52.** $y = 2 + \log_2(x+1)$

Library of Parent Functions **In Exercises 53–56, use the graph of $y = \log_3 x$ to match the function with its graph. [The graphs are labeled (a), (b), (c), and (d).]**



53. $f(x) = \log_3 x + 2$ **54.** $f(x) = -\log_3 x$

55. $f(x) = -\log_3(x+2)$ **56.** $f(x) = \log_3(1-x)$

In Exercises 57–62, use the graph of f to describe the transformation that yields the graph of g.

57. $f(x) = \log_{10} x$, $g(x) = -\log_{10} x$

58. $f(x) = \log_{10} x$, $g(x) = \log_{10}(x+7)$

59. $f(x) = \log_2 x$, $g(x) = 4 - \log_2 x$

60. $f(x) = \log_2 x$, $g(x) = 3 + \log_2 x$

61. $f(x) = \log_8 x$, $g(x) = -2 + \log_8(x+3)$

62. $f(x) = \log_8 x$, $g(x) = 4 + \log_8(x-1)$

In Exercises 71–74, find the domain, vertical asymptote, and x-intercept of the logarithmic function, and sketch its graph by hand. Verify using a graphing utility.

71. $f(x) = \ln(x-1)$ **72.** $h(x) = \ln(x+1)$

73. $g(x) = \ln(-x)$ **74.** $f(x) = \ln(3-x)$

In Exercises 75–80, use the graph of $f(x) = \ln x$ to describe the transformation that yields the graph of g.

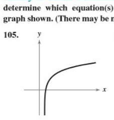
75. $g(x) = \ln(x+3)$ **76.** $g(x) = \ln(x-4)$

77. $g(x) = \ln x - 5$ **78.** $g(x) = \ln x + 4$

79. $g(x) = \ln(x-1) + 2$ **80.** $g(x) = \ln(x+2) - 5$

Library of Parent Functions **In Exercises 105 and 106, determine which equation(s) may be represented by the graph shown. (There may be more than one correct answer.)**

105.



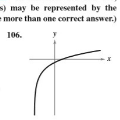
(a) $y = \log_2(x+1) + 2$

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

(c) $y = 2 - \log_2(x-1)$

(d) $y = \log_2(x+2) + 1$

106.



(a) $y = \ln(x-1) + 2$

(b) $y = \ln(x+2) - 1$

(c) $y = 2 - \ln(x-1)$

(d) $y = \ln(x-2) + 1$

Feb 2-9:51 PM

3.2 Logarithmic Functions and Their Graphs

Day 2

exp $\longrightarrow$ log $\longrightarrow$ exp

evaluate

properties of logs

Oct 30-10:19 AM

Rewrite from exponential form to log form

$x = a^y$ base

Drop, criss, cross

$y = \log_a x$

y equals log base a of x

Oct 30-10:23 AM

Rewrite in log form

$3 = 4^x$ $\quad x = 5^2$ $\quad 4 = x^3$ $\quad e^x = 3$

$x = \log_4 3$ $\quad 2 = \log_5 x$ $\quad 3 = \log_x 4$ $\quad \ln_e 3 = x$

$\ln 3 = x$

Oct 30-10:26 AM

Rewrite in exponential form

$\log_x 4 = 7$ $\quad \log_{10} 3 = x$ $\quad \log_2 x = 4$ $\quad \ln 5 = x$

$x^7 = 4$ $\quad 10^x = 3$ $\quad 2^4 = x$ $\quad e^x = 5$

Oct 30-10:30 AM

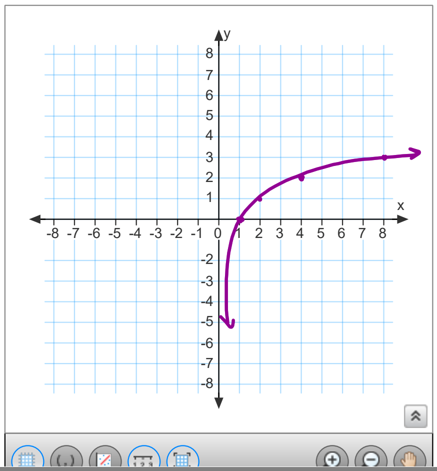
log equation in general $y = \log_a x$

Rewrite in exponential form

$\log_2 8 = 3$ (8,3) $\log_2 1 = 0$ (1,0) $\log_2 2 = 1$ (2,1)

$2^3 = 8$ $2^0 = 1$ $2^1 = 2$

What does it mean????



$\log_2 5 = ?$

$2^2 = 4$

$2^3 = 8$

$2^? = 5$

Oct 30-10:34 AM

Using logs to evaluate

$y = \log_2 8$

Change to exponential

$2^y = 8$ get bases to match

$2^y = 2^3$ so... exponents are equal

$y = 3$

$y = \log_3 1$

$1 = 3^y$

$3^0 = 3^y$

$y = 0$

$y = \log_{10} \frac{1}{1000}$

$10^y = \frac{1}{1000}$

$10^y = \frac{1}{10^3}$

$10^y = 10^{-3}$

$y = -3$

Oct 18-12:46 PM

Properties of Logs

$\log_a 1 = 0 \longrightarrow a^0 = 1$ ✓

RP $(1,0)$

$\log_a a = 1 \longrightarrow a^1 = a$ ✓

RP $(a,1)$

$\log_a a^x = x \longrightarrow a^x = a^x$ ✓

$a^{\log_a x} = x \longrightarrow \log_a x = \log_a x$

$\ln 1 = 0 \longrightarrow e^0 = 1$

$\ln_e e = 1 \longrightarrow e^1 = e$

$\ln_e e^x = x \longrightarrow e^x = e^x$ ✓

$e^{\ln x} = x \longrightarrow \ln x = \ln x$

If $\log_a x = \log_a y$

Then $x = y$

If $\ln x = \ln y$

Then $x = y$

Oct 18-12:48 PM

Now that we have these properties, let's revisit our evaluation problems.

$y = \log_2 8$
$= \log_2 2^3$
$= 3$

$y = \log_5 25$
$= \log_5 5^2$
$= 2$

$y = \log_{10} \dfrac{1}{1000}$
$= \log_{10} 10^{-3}$
$= -3$

$y = \log_7 \dfrac{1}{49}$
$\log_7 49^{-1}$
$\log_7 7^{-2} = -2$

$y = \log_3 1$
$= 0$

$y = \log_{12} 12^1$
$= 1$

$y = \ln 1 = 0$

$y = \ln e = 1$

Nov 1-5:59 AM

If no base is written for a common logarithmic expression it is understood to be 10!

- common log base 10 is what calculator uses

- e is the base for natural logs

$\ln \pi$

$\log 15$

Oct 23-10:28 AM

Evaluate the following using your calculator

$10^0 = 1$ $\quad \log 6 = .78$

$10^1 = 10$ $\quad$ between 0 & 1

10

$\log_{10} 10 = 1$

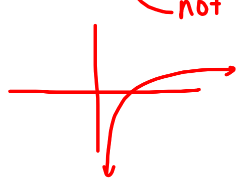
$e^0 = 1$ $\quad \ln 4 = 1.37$

$e^1 = e = 2.7$

$e^2 = 7\ 4$

$\ln e = 1$

$\log(-3)$ = error
not in domain



$D\ (0, \infty)$

Nov 1-6:51 AM

HOMEWORK

p 203 1-19 odd, 25-41 odd,

63-69 odd

Aug 29-6:38 AM