

8.2 Logarithm Graphs

PRACTICE

Directions: Describe the shifts of the graph for each equation, in comparison to its base function.

1) $f(x) = \ln(x - 2) - 3$

Shifts to the right 2
and down 3

2) $f(x) = \log(x) + 5$

Shifts up 5.

3) $f(x) = \log_2(x + 5) - 4$

Shifts left 5 and down 4.

Directions: Find the x-intercepts of the following functions.

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

$0 = \log_2(x+1) - 2$

$2 = \log_2(x+1)$

$2^2 = x+1$

$4 = x+1$

$3 = x$

$(3, 0)$

5) $f(x) = \log_3(x - 3) + 2$

$0 = \log_3(x-3) + 2$

$-2 = \log_3(x-3)$

$3^{-2} = x-3$

$\frac{1}{9} = x-3$

$\frac{10}{9} = x$

$(\frac{10}{9}, 0)$

6) $f(x) = \log(x - 5) - 1$

$0 = \log(x-5) - 1$

$1 = \log(x-5)$

$10^1 = x-5$

$10 = x-5$

$15 = x$

$(15, 0)$

Directions: Find the vertical asymptote of the graph for each equation.

7) $f(x) = \log_6(x + 10) - 2$

$x+10=0$

$x = -10$

8) $f(x) = \log_2(x - 4) - 2$

$x-4=0$

$x = 4$

9) $f(x) = \ln(x) - 3$

$x=0$

Directions: Find the end behavior of the following function.

10) $f(x) = \log_4(x + 4) - 12$

$x \rightarrow -4^+, f(x) \rightarrow -\infty$

$x \rightarrow \infty, f(x) \rightarrow \infty$

11) $f(x) = \ln(x + 7) - 10$

$x \rightarrow 7^+, f(x) \rightarrow -\infty$

$x \rightarrow \infty, f(x) \rightarrow \infty$

Directions: For the given function, find the x-intercept, vertical asymptote, end behavior, describe any shifts and then sketch the graph.

12) $f(x) = \log(x - 1) + 3$

x-intercepts: $0 = \log(x-1) + 3$

$-3 = \log(x-1)$

$10^{-3} = x-1$

$.001 + 1 = 0$

$(1.001, 0)$

$x = 1.001$

End Behavior: $x \rightarrow 1^+, f(x) \rightarrow -\infty$

$x \rightarrow \infty, f(x) \rightarrow \infty$

Vertical Asymptote:

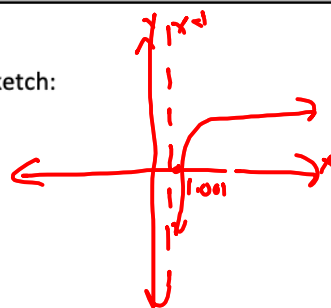
$x-1=0$

$x=1$

Shifts:

Shifts right 1, and up 3

Sketch:



13) $f(x) = \log_2(x + 8) - 4$

x-intercepts: $0 = \log_2(x+8) - 4$

$4 = \log_2(x+8)$

$2^4 = x+8$

$16 = x+8 \rightarrow x=8$

Vertical Asymptote:

$x+8=0$

$x=-8$

End Behavior:

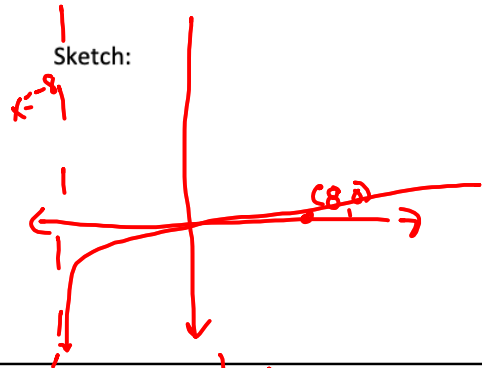
$x \rightarrow -8^+, f(x) \rightarrow -\infty$

$x \rightarrow \infty, f(x) \rightarrow \infty$

Shifts:

Shifts left 8, down 4

Sketch:



14) $f(x) = \log_3(x) - 2$

x-intercepts:

$0 = \log_3 x - 2$

$2 = \log_3 x$

$3^2 = x$

$9 = x$

Vertical Asymptote:

$x=0$

End Behavior:

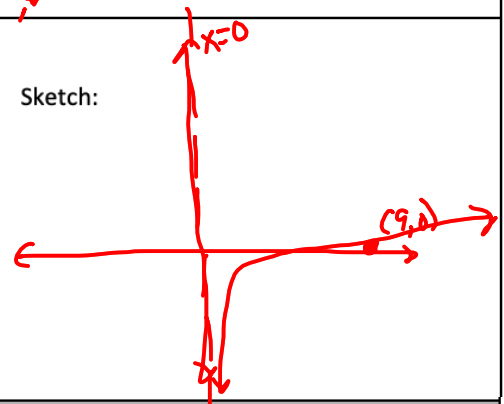
$x \rightarrow 0^+, f(x) \rightarrow -\infty$

$x \rightarrow \infty, f(x) \rightarrow \infty$

Shifts:

Shifts down 2

Sketch:



Find the discriminant. State the number and nature of the solutions for each quadratic below.

15) $10r^2 - 9r - 8 = -10$

$10r^2 - 9r + 2 = 0$

$b^2 - 4ac$
 $(-9)^2 - 4(10)(2)$
 $81 - 80$
 1

Discriminant is positive so there are two real solutions.

16) $-9a^2 - 4 = -5a$

$-9a^2 + 5a - 4 = 0$

$b^2 - 4ac$
 $5^2 - 4(-9)(-4)$
 -719

Discriminant is negative so there are no real solutions but there are two complex solutions.