Lesson 3.02 Graphs of Logarithms

Students will be able to:

- Content Objective: Graph logarithms.
- Language Objective: Discuss the relationship between transformations and logarithmic graphs.

Warm Up

The expression $\log_4\left(\frac{1}{16}\right)$ is equivalent to

(1) $\frac{1}{2}$

(2) 2

(3) $-\frac{1}{2}$

(4) -2

Vocabulary Review

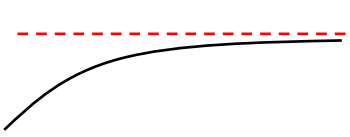
Identify whether the following statements are true or false. Fix the false statements to make them true.

1. _____ Exponential and logarithmic equations are inverses of each other that have the same base.
2. _____ The correct logarithmic form of $2^4 = 16$ is $\log_4 16 = 2$.
3. _____ To graph the exponential form of a logarithm, reflect the graph over the line $y = x$.
4. _____ The correct exponential form of $\log_3 9 = 2$ is $3^2 = 9$.
5. _____ When given $\log 100$, it is known that the base is 100.

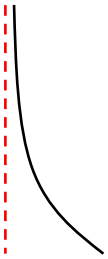
Graphic Organizer

Asymptote: A line that a function approaches but never crosses. For example, we have seen that exponential functions have an asymptote.

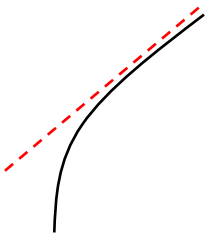
Horizontal



Vertical



Oblique (Slant)

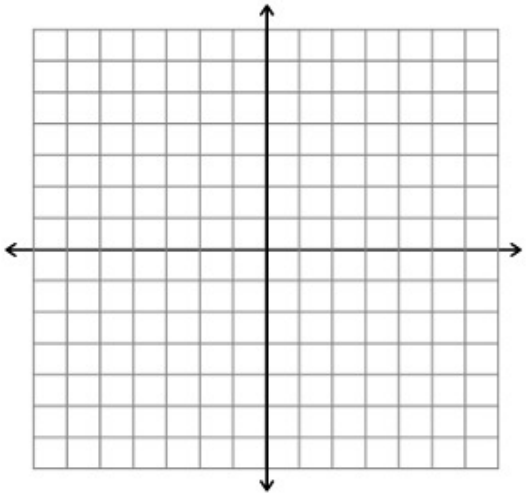


Skill 1: Graphing Logarithms

a. Construct a table of values for $f(x) = 2^x$ and $g(x) = \log_2 x$, then graph both functions on the axes below.

$f(x) = 2^x$	
-2	
-1	
0	
1	
2	
3	

$g(x) = log_2 x$	
0	
0.25	
0.5	
2	
4	
8	



b. Show *algebraically* that the inverse of $y = 2^x$ is $y = log_2 x$.

c. Find the domain and range of $y = 2^x$ in interval notation and state the asymptote.

d. Find the domain and range of $y = log_2 x$ in interval notation and state the asymptote.

Exercise 1: Graphing Logarithms

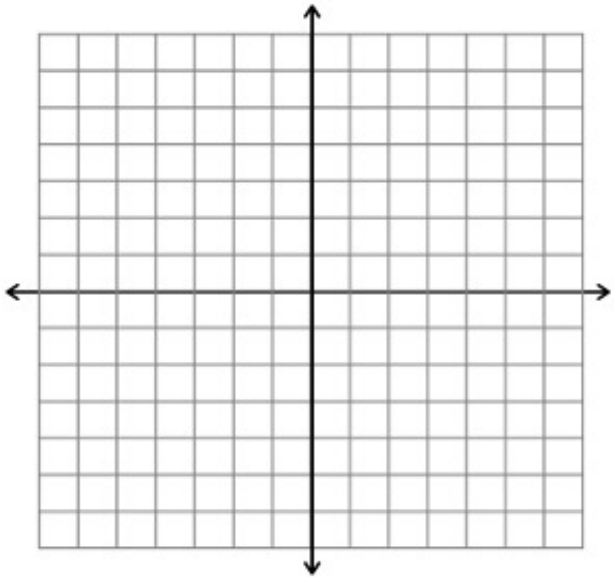
Consider the logarithmic function below.

$$f(x) = \log_3(4 - x)$$

a. Graph $f(x)$ on the axes provided.

b. State the domain of f interval notation.

c. State the equation of the asymptote.



Skill 2: Properties of Logarithmic Graphs

Which statement below about the graph of $f(x) = -\log(x + 2) - 3$ is true?

(1) $f(x)$ has a y- intercept at $(0, -3)$

(2) $-f(x)$ has a y- intercept at $(0, -3)$

(3) As $x \to \infty, f(x) \to \infty$

(4) As $x \to -2, f(x) \to -\infty$

Exercise 2: Properties of Logarithmic Graphs

If $f(x) = \log_4 x$ and $g(x)$ is the image of $f(x)$ after a translation eight units to the left, which equation represents $g(x)$?

(1) $g(x) = \log_4(x + 8)$

(2) $g(x) = \log_4 x + 8$

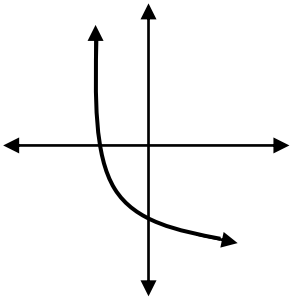
(3) $g(x) = \log_4(x - 8)$

(4) $g(x) = \log_4 x - 8$

Check Point

Which sketch could represent the function $f(x) = -\log_{100}(x - 3)$?

(1)



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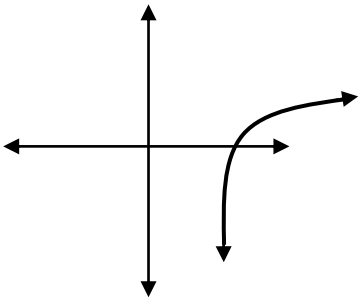

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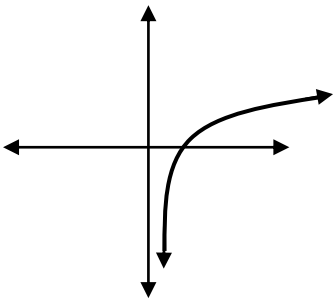

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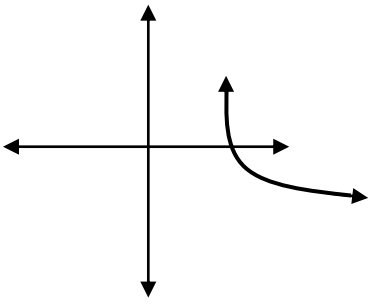
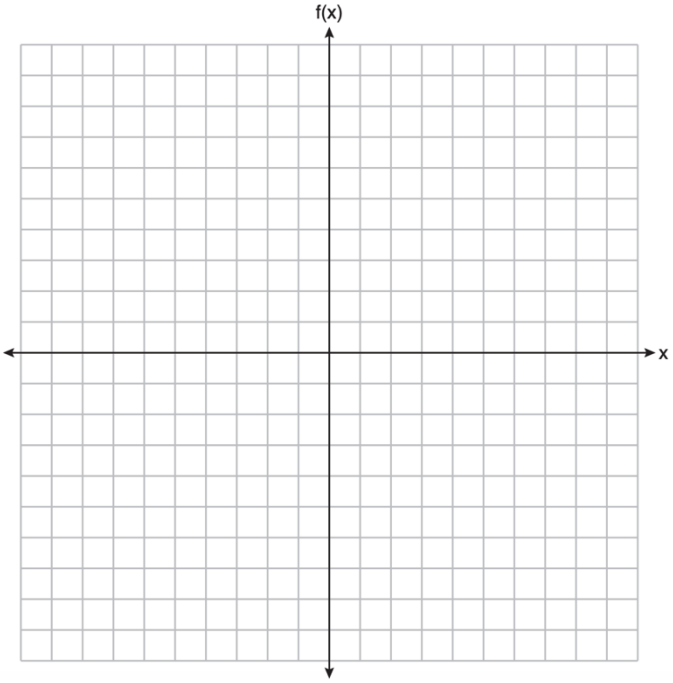


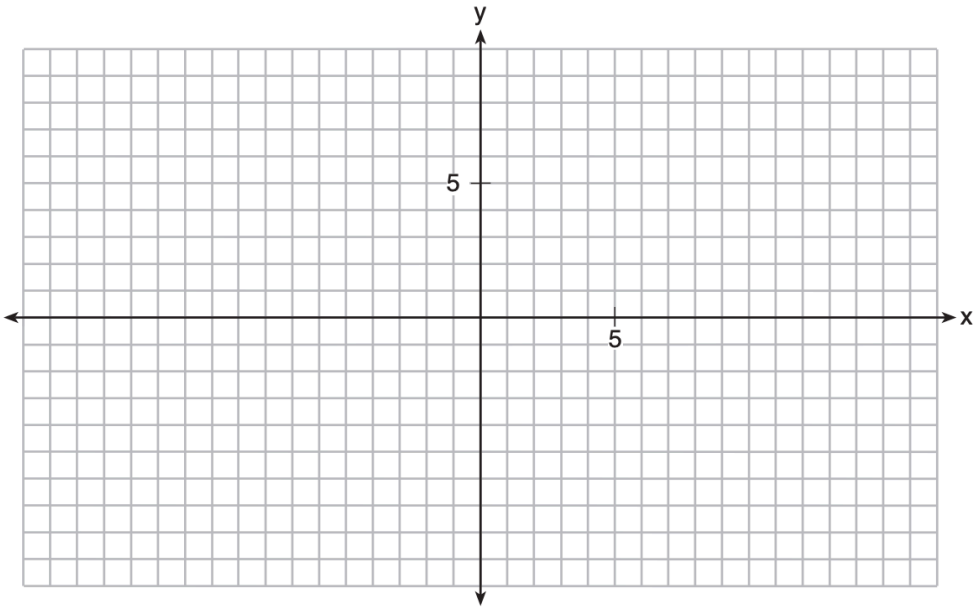
3.02- Problem Set

Name: _____

1. Graph $f(x) = \log_2(x + 4)$ on the set of axes below.



2. Graph the function $y = \log_2(x - 4) + 1$ on the grid below.



Describe the transformation that maps $y = \log_2 x$ to $y = \log_2(x - 4) + 1$