

CHAPTER

11

Exponential and Logarithmic Functions

Digital Vision
iStockphoto.com

Copyright © Cengage Learning. All rights reserved.

11.3

Graphs of Logarithmic Functions



Objective

- 1 Graph logarithmic functions



Graph logarithmic functions

Graph logarithmic functions

The graph of a logarithmic function can be drawn by using the relationship between the exponential and logarithmic functions.

To graph $g(x) = \log_2 x$, think of the function as the equation $y = \log_2 x$.

$$\begin{aligned}g(x) &= \log_2 x \\ y &= \log_2 x\end{aligned}$$

Write the equivalent exponential equation.

$$x = 2^y$$

Graph logarithmic functions

Because the equation is solved for x in terms of y , it is easier to choose values of y and find the corresponding values of x . The results can be recorded in a table.

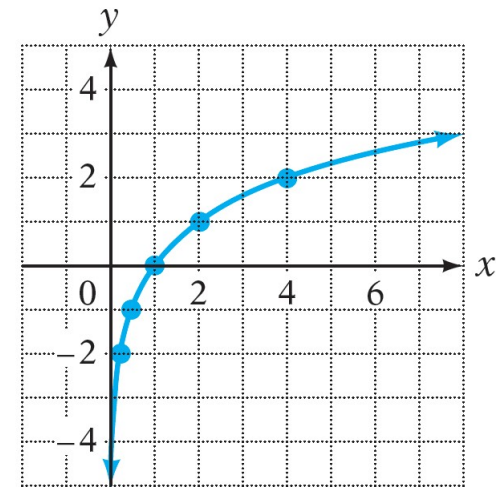
$x = 2^y$	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2

Graph logarithmic functions

Graph the ordered pairs on a rectangular coordinate system.

Connect the points with a smooth curve.

Applying the vertical line and horizontal line tests reveals that $g(x) = \log_2 x$ is the graph of a 1–1 function.



Example 1

Graph. **A.** $f(x) = \log_3 x$ **B.** $f(x) = 2 \log_3 x$

Solution:

A. $f(x) = \log_3 x$

$$y = \log_3 x$$

$$x = 3^y$$

Substitute y for $f(x)$.

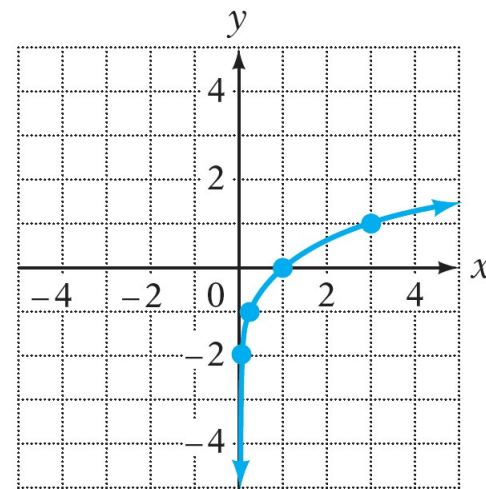
Write the equivalent exponential equation.

Example 1 – *Solution*

cont'd

Choose values of y , and find the corresponding values of x . Graph the ordered pairs on a rectangular coordinate system. Connect the points with a smooth curve.

$x = 3^y$	y
$\frac{1}{9}$	-2
$\frac{1}{3}$	-1
1	0
3	1



Example 1 – *Solution*

cont'd

B. $f(x) = 2 \log_3 x$

$$y = 2 \log_3 x$$

$$\frac{y}{2} = \log_3 x$$

$$x = 3^{\frac{y}{2}}$$

Substitute y for $f(x)$.

Solve the equation for $\log_3 x$.

Write the equivalent exponential equation.

Example 1 – *Solution*

cont'd

Choose values of y , and find the corresponding values of x . Graph the ordered pairs on a rectangular coordinate system. Connect the points with a smooth curve.

$x = 3^{\frac{y}{2}}$	y
$\frac{1}{9}$	-4
$\frac{1}{3}$	-2
1	0
3	2

