Graphing Exponential and Logarithmic Functions

Exponential Function – An exponential function is any function that can be written in the form of f(x) = a^x , where x is a real number, a > 0 and a≠ 1. The number a is called the base of the exponential function.

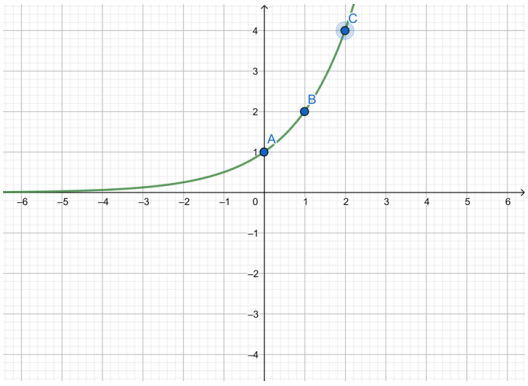
Example: Graph the following exponential function by using a table to find at least three ordered pairs.

1) $f(x) = 2^x$

Solution: a) Let x = 0, 1, and 2 and plug into the function to solve for f(x)

A) f(0) = $2^0 = \mathbf{1}$ B) f(1) = $2^1 = \mathbf{2}$ C) f(2) = $2^2 = \mathbf{4}$

x	y
0	1
1	2
2	4



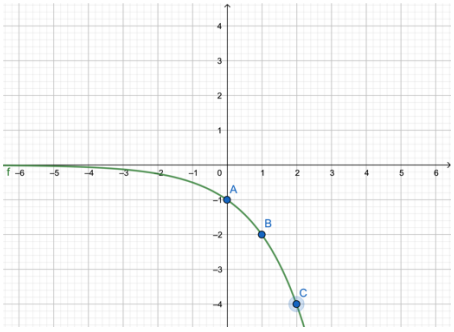
Example: Graph the following exponential function by using a table to find at least three ordered pairs.

2) $f(x) = -2^x$

Solution: a) The graph from Example 1 reflected over the x-axis.

A) f(0) = $-2^0 = -2^0 = \mathbf{-1}$ B) f(1) = $-2^1 = \mathbf{-2}$ C) f(2) = $-2^2 = \mathbf{-4}$

x	y
0	-1
1	-2
2	-4



Logarithmic Function – Any function in the form of y = $\log_a x$ which is the exponent y such that $a^y = x$.

The number a is called the base of the logarithm and a can be any positive constant other than 1.

Example: Graph the following logarithmic function by using a table to find at least three ordered pairs.

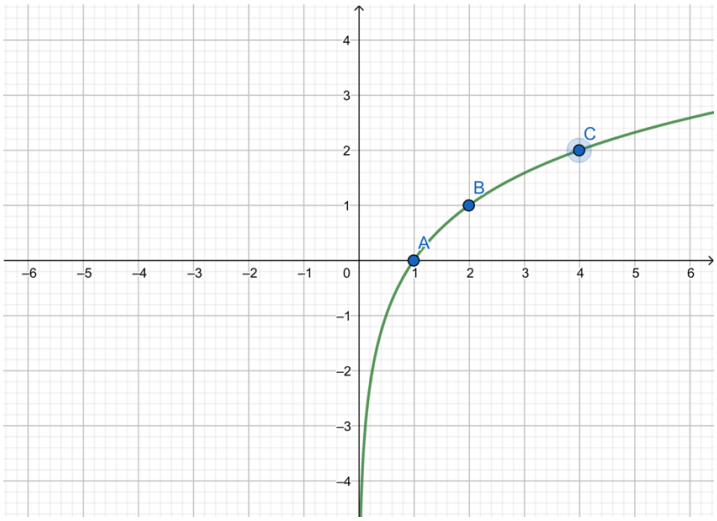
3) $f(x) = \log_2 x$

Solution: a) Remember that y = f(x) and in this case $2^y = x$

b) Let y = 0, 1, and 2 and plug into the function to solve for x

A) x = $2^0 = \mathbf{1}$ B) x = $2^1 = \mathbf{2}$ C) x = $2^2 = \mathbf{4}$

x	y
1	0
2	1
4	2



Example: Graph the following logarithmic function by using a table to find at least three ordered pairs.

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

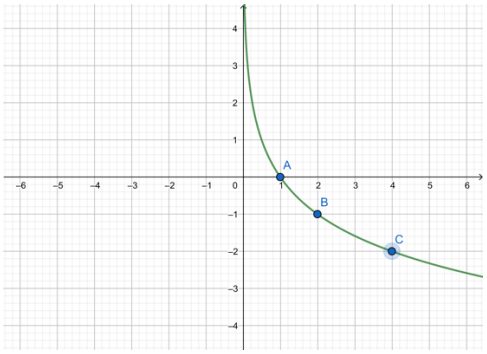
Solution: a) This is the graph of Example 3 has been reflected over the x-axis.

b) Remember that y = f(x) and in this case $2^{-y} = x$

Let y = 0, −1, and −2 and plug into the function to solve for x

A) x = $2^0 = \mathbf{1}$ B) x = $2^{-(-1)} = 2^1 = \mathbf{2}$ C) x = $2^{-(-2)} = 2^2 = \mathbf{4}$

x	y
1	0
2	−1
4	−2

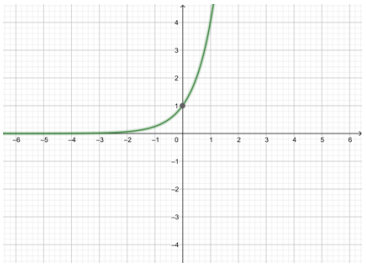


Practice Problems:

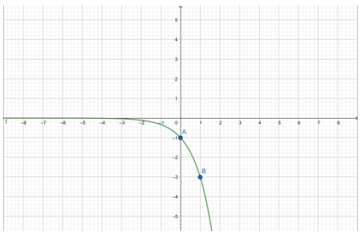
Graph the following exponential and logarithmic functions by using a table to make at least three ordered pairs:

Solution:

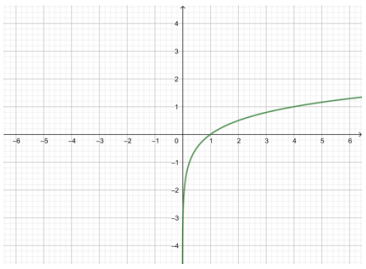
1) $f(x) = 4^x$



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



3) $f(x) = log_4 x$



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