

## 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  $a \neq 1$ . 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)  $f(x) = 2^x$

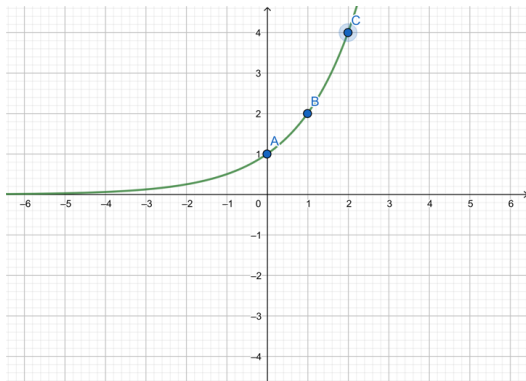
**Solution:** a) Let  $x = 0, 1,$  and  $2$  and plug into the function to solve for  $f(x)$

A)  $f(0) = 2^0 = 1$

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

C)  $f(2) = 2^2 = 4$

x	y
0	1
1	2
2	4



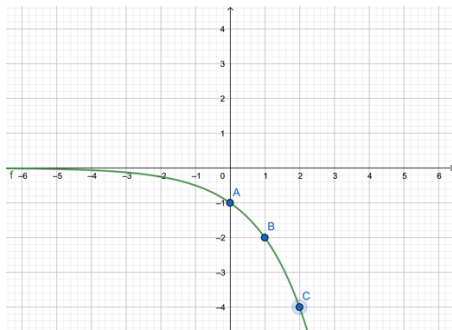
**Example:** Graph the following exponential function by using a table to find at least three ordered pairs.

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

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

A)  $f(0) = -2^0 = -2^0 = -1$     B)  $f(1) = -2^1 = -2$     C)  $f(2) = -2^2 = -4$

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  $2^y = x$

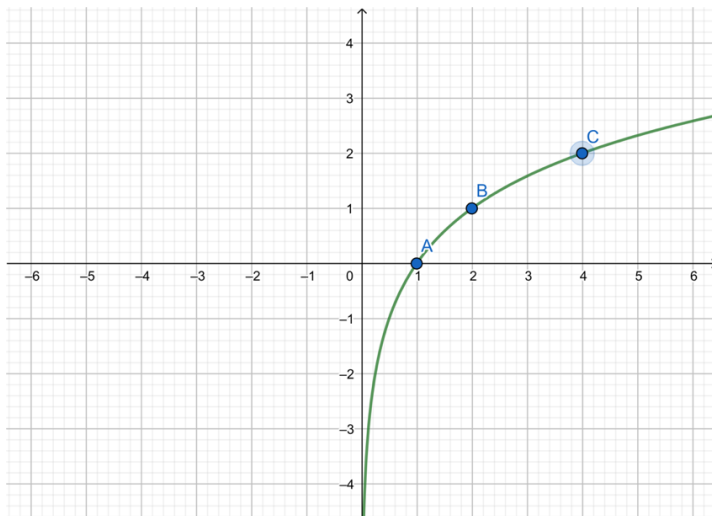
b) Let  $y = 0, 1,$  and  $2$  and plug into the function to solve for  $x$

A)  $x = 2^0 = 1$

B)  $x = 2^1 = 2$

C)  $x = 2^2 = 4$

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  $2^{-y} = x$

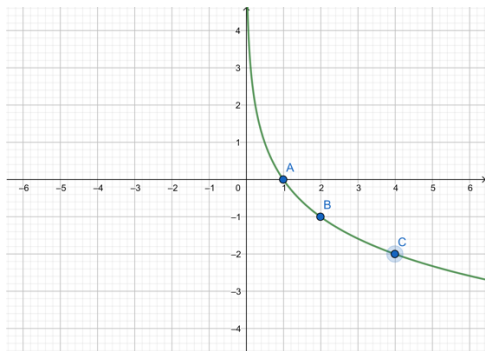
Let  $y = 0, -1,$  and  $-2$  and plug into the function to solve for  $x$

A)  $x = 2^0 = 1$

B)  $x = 2^{-(-1)} = 2^1 = 2$

C)  $x = 2^{-(-2)} = 2^2 = 4$

x	y
1	0
2	-1
4	-2

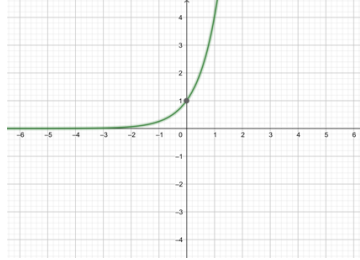


Practice Problems:

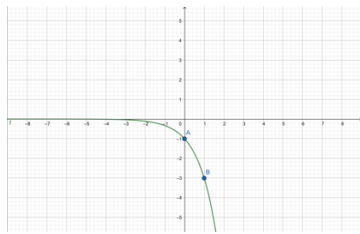
Graph the following exponential and logarithmic functions by using a table to make at least three ordered pairs:

Solution:

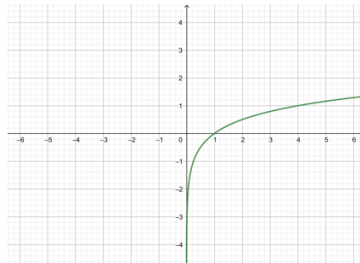
1)  $f(x) = 4^x$



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



3)  $f(x) = \log_4 x$



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

