Exponential Functions

Learning Goal:

By the end of today, I will be able to recognize and sketch an exponential function, its key graphing components, and whether it is a "growth" or "decay" function.

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An exponential functions is different from our previous functions because it is the first to have a variable/unknown as an exponent.

$$f(x) = 2^x \qquad f(x) = 5^x$$

Note the base can be any real number except 0 and 1.

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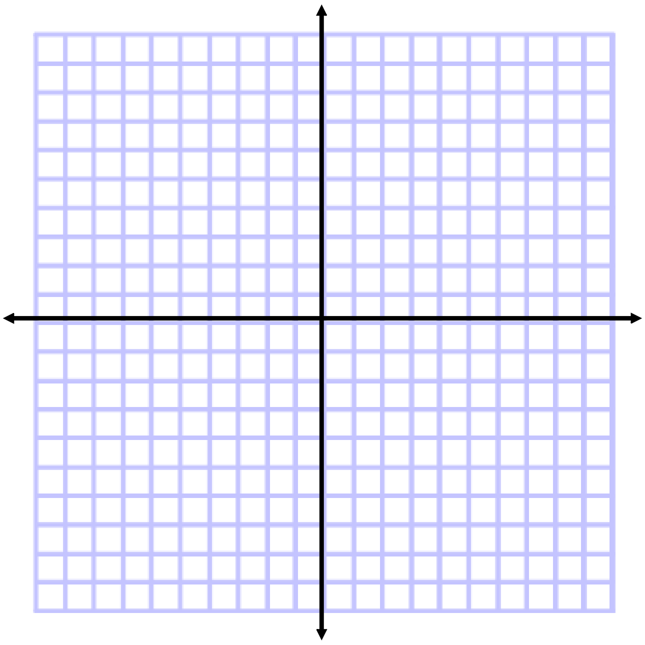
Complete the table for the following function and use the coordinates to graph the function:

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

X	Y
3	
2	
1	
0	
-1	
-2	
-3	
-4	

FD



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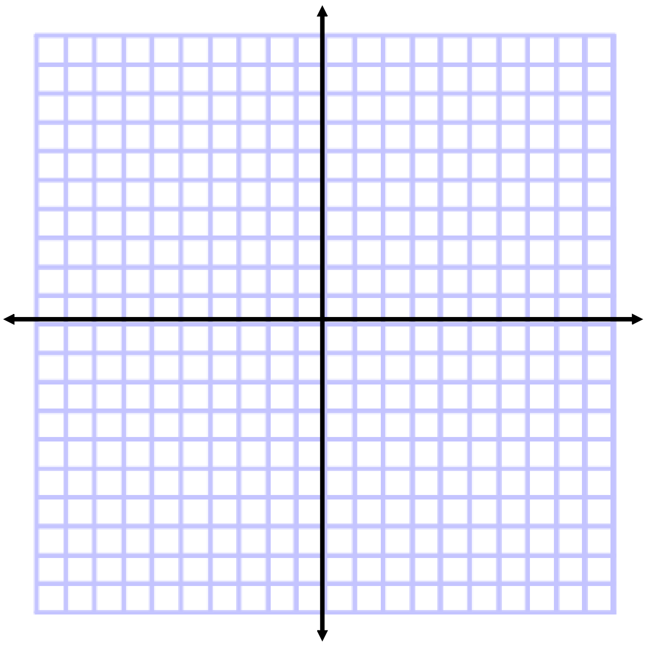
Complete the table for the following function and use the coordinates to graph the function:

$$f(x) = \left(\frac{1}{2}\right)^x$$

X	Y
3	
2	
1	
0	
-1	
-2	
-3	
-4	

FD



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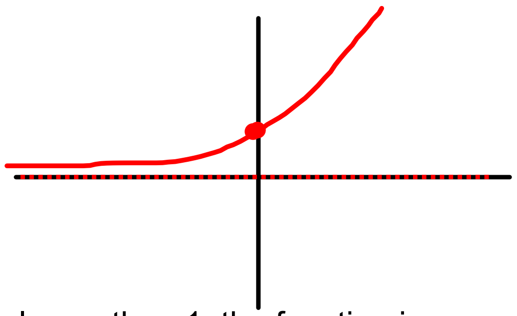
An asymptote is a line a graph cannot cross, although it might get very close to it.

The key elements to drawing an exponential base curve are the original y intercept and horizontal asymptote components.



For bases larger than 1, the function is normally considered to be an example of exponential growth.

For bases between 0 and 1, the function is normally considered to be an example of exponential decay.

The Finite differences of an exponential function repeat the same pattern with each difference.

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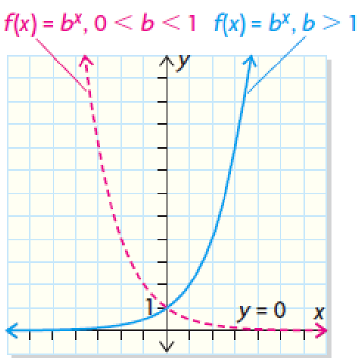
Need to Know

- The exponential function $f(x) = b^x$ has the following characteristics:
  - The function is exponential only if $b > 0$ and $b \neq 1$; its domain is the set of real numbers, and its range is the set of all positive real numbers.
  - If $b > 1$, the greater the value, the faster the growth.
  - If $0 < b < 1$, the lesser the value, the faster the decay.
  - The function has a horizontal *asymptote*, which is the *x*-axis.
  - The function has a *y*-intercept of 1.



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Make a table of values [x:-3 to 3] and graph the following:

$$y = 3^x$$

$$y = 10^x$$

$$y = \left(\frac{1}{4}\right)^x$$

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