

# 7.1 New

Monday, November 22, 2021 8:34 AM

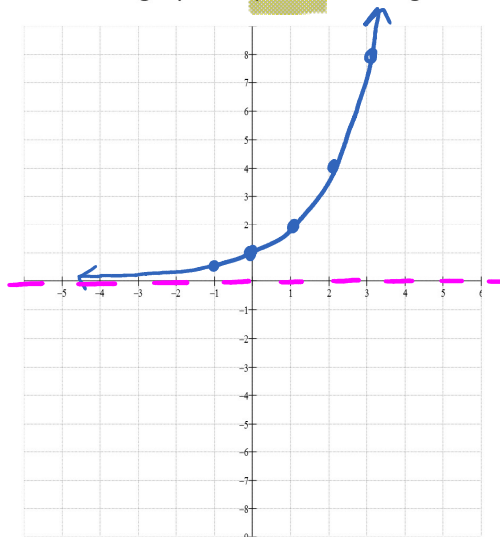
Pre-Calculus 12

## 7.1 Characteristics of Exponential Functions

An exponential function is of the form:  $y = C^x$  where  $C$  is a constant and  $x$  is a variable

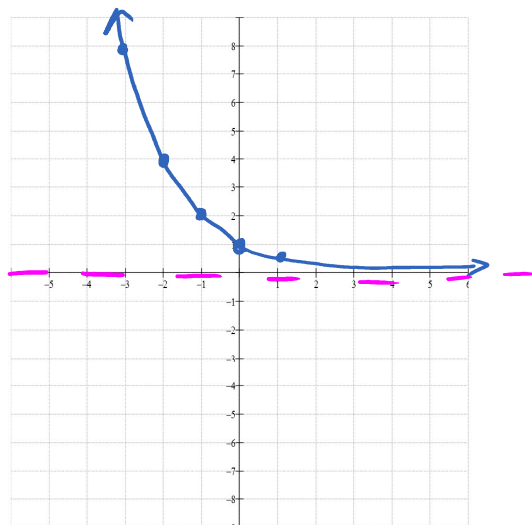
**Ex. #1:** Use a table of values to sketch the graph of  $y = 2^x$  on the grid below.

x	y
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$
3	$2^3 = 8$



**Ex. #2:** Use a table of values to sketch the graph of  $y = \left(\frac{1}{2}\right)^x$  on the grid below.

x	y
-3	$\left(\frac{1}{2}\right)^{-3} = 2^3 = 8$
-2	$\left(\frac{1}{2}\right)^{-2} = 2^2 = 4$
-1	$\left(\frac{1}{2}\right)^{-1} = 2^1 = 2$
0	$\left(\frac{1}{2}\right)^0 = 1$
1	$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$

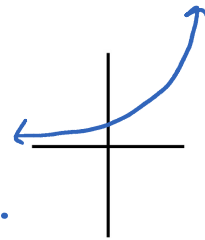


~~if c neg~~  
~~if (2)~~  
~~4~~  
~~16~~

The graph of an exponential function  $y = c^x$  is:

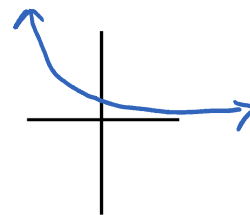
- Increasing for  $c > 1$

$L \rightarrow R$   
 y-values increase



- Decreasing for  $0 < c < 1$

$L \rightarrow R$   
 y-values decrease



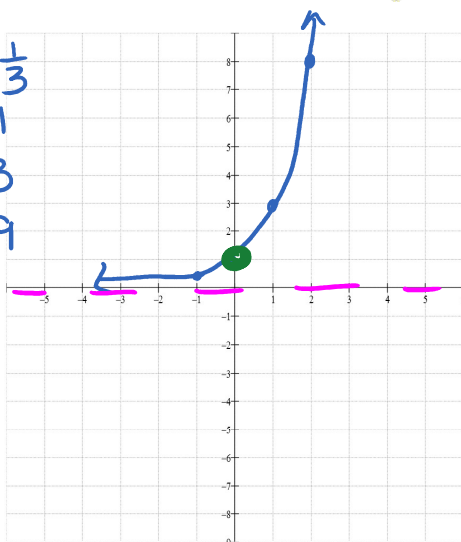
- constant function for  $c = 1$

$y = c^x$   $c > 0$   $c \neq 1$

$y = 1^x$   
 $y = 1$

**Ex. #3:** Graph the function  $y = 3^x$  and state the following:

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



Domain:  $\{x \mid x \in \mathbb{R}\}$   
 Range:  $\{y \mid y > 0, y \in \mathbb{R}\}$

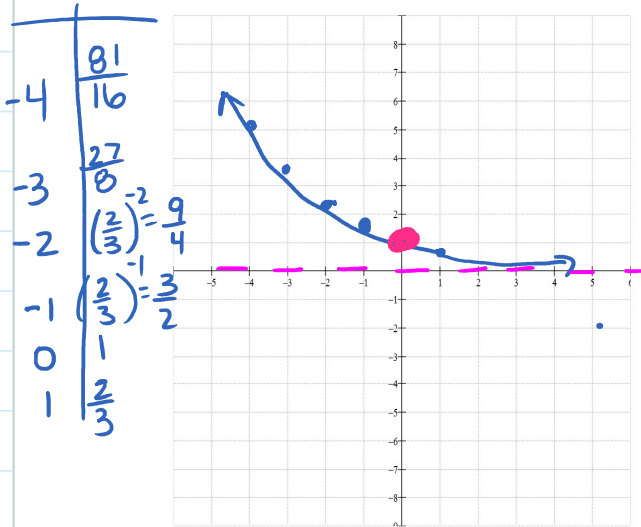
Increasing or Decreasing

y-int:  $(0, 1)$

x-int: None

Equation of the asymptote:  
 $y = 0$

**Ex. #4:** Graph the function  $y = \left(\frac{2}{3}\right)^x$  and state the following:



Domain:  $\{x \mid x \in \mathbb{R}\}$

Range:  $\{y \mid y > 0, y \in \mathbb{R}\}$

Increasing or Decreasing

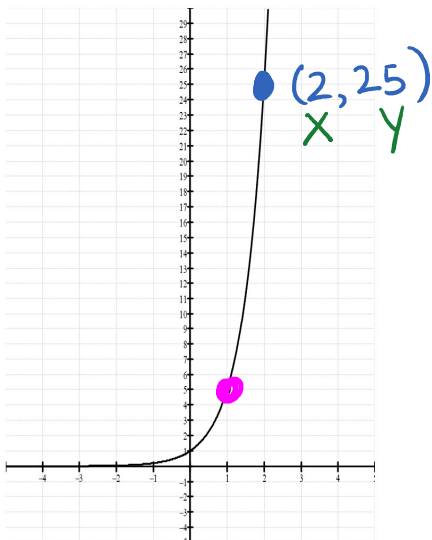
y-int:  $(0, 1)$

x-int: None

Equation of the asymptote:

$$y = 0$$

**Ex. #5:** Given the graph of the following exponential function state the equation.



$$y = c^x$$

$$25 = c^2$$

$$\pm \sqrt{25} = c$$

$$c > 0$$

$$c = +5$$

$$y = 5^x$$

$$y = A_0 C^x$$

$A_0$  = initial amount  
 $C$  = rate of change  
 $x$  = time

**Ex. #6:** A certain bacteria culture triples every week.

(a) Write an exponential function that models this situation.

$$C = 3 \quad y = A_0 (3)^x \quad x = \text{time weeks}$$

(b) If there are only 5 bacteria present initially, how many bacteria are there after 11 weeks?

$$A_0 = 5 \quad y = 5(3)^{11}$$

$$x = 11 \quad y = 885\,735 \text{ bacteria}$$

**Ex. #7:** A new car depreciates in value by 12% each year. Write an exponential function that models the value of the car,  $V$ , as a function of time.

$$C = \text{rate} = 100\% - 12\%$$

$$C = 88\% = 0.88$$

decreasing

$$t = \text{time years}$$

$$V = V_0 (0.88)^t$$

**Ex. #8:** The population of a town is growing by 6% each year. Write an exponential function that models the population,  $P$ , as a function of time. What assumptions did you make?

growing increasing

$$C = \text{rate} = 100\% + 6\%$$

$$C = 106\% = 1.06$$

$$t = \text{time years}$$

$$P = P_0 (1.06)^t$$

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