

Exponential Functions Notes

Exponential Functions

An *exponential function* f is defined by the equation $y = f(x) = a^x$ where $a > 0, a \neq 1$. The domain of f is the set of all real numbers and the range of f is the set of positive numbers.

Properties of the Exponential Function in the form of $y = a^x$

- The domain of exponential function f is a set of all real numbers.
- The range of a function is a set of all positive real numbers. In the function $y = a^x$, if $a > 1$, then the graph is continuously increasing. If $0 < a < 1$, then the graph is continuously decreasing.
- The function of $y = a^x$, does not have a zero. The graph of does not intersect the x -axis.
- The function $y = a^x$ always contains the point $(0, 1)$.

Sample Problem 1: Find $f(x)$ given the value of x below.

$$y = 0.2^x$$

1. $x = -2$

Solution:

$$y = 0.2^{-2} = \left(\frac{1}{5}\right)^{-2} = 5^2 = 25$$

2. $x = 0$

Solution:

$$y = 0.2^0 = 1$$

3. $x = 2$

Solution:

$$y = 0.2^2 = \frac{1}{5^2} = \frac{1}{25} = 0.04$$

4. $x = 4$

Solution:

$$y = 0.2^4 = \frac{1}{5^4} = \frac{1}{625} = 0.0016$$

Sample Problem 2: Draw the graph of the following function.

5. Graph the exponential function $y = \left(\frac{1}{2}\right)^x$.

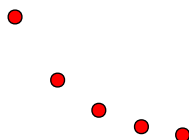
x	-2	-1	0	1	2
y					

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

Exponential Functions Notes

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

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



6. Graph the function $y = 2^{x+1}$.

X	-2	-1	0	1	2
y					

X	-2	-1	0	1	2
y	$y = 2^{-2+1}$ $= \frac{1}{2}$	$y = 2^{-1+1}$ $= 1$	$y = 2^{0+1}$ $= 2$	$y = 2^{1+1}$ $= 4$	$y = 2^{2+1}$ $= 8$

Graph $y = 2^{x+1}$

$f(x) = 2^{(x+1)}$
Series 1

