

9-1 Study Guide and Intervention

Exponential Functions

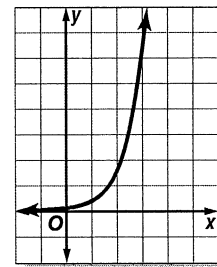
Exponential Functions An exponential function has the form $y = ab^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$.

Properties of an Exponential Function	<ol style="list-style-type: none"> The function is continuous and one-to-one. The domain is the set of all real numbers. The x-axis is the asymptote of the graph. The range is the set of all positive numbers if $a > 0$ and all negative numbers if $a < 0$. The graph contains the point $(0, a)$.
Exponential Growth and Decay	<p>If $a > 0$ and $b > 1$, the function $y = ab^x$ represents exponential growth.</p> <p>If $a > 0$ and $0 < b < 1$, the function $y = ab^x$ represents exponential decay.</p>

Example 1 Sketch the graph of $y = 0.1(4)^x$. Then state the function's domain and range.

Make a table of values. Connect the points to form a smooth curve.

x	-1	0	1	2	3
y	0.025	0.1	0.4	1.6	6.4



The domain of the function is all real numbers, while the range is the set of all positive real numbers.

Example 2 Determine whether each function represents exponential growth, decay, or neither.

a. $y = 0.5(2)^x$
 exponential growth, since the base, 2, is greater than 1

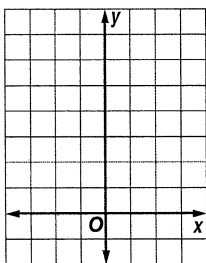
b. $y = -2.8(2)^x$
 neither, since -2.8 , the value of a is less than 0.

c. $y = 1.1(0.5)^x$
 exponential decay, since the base, 0.5, is between 0 and 1

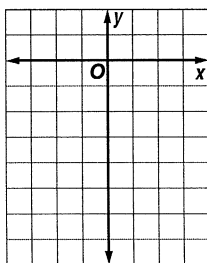
Exercises

Sketch the graph of each function. Then state the function's domain and range.

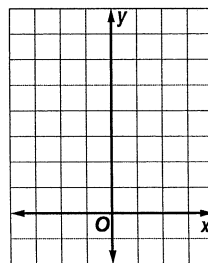
1. $y = 3(2)^x$



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



3. $y = 0.25(5)^x$



Determine whether each function represents exponential growth, decay, or neither.

4. $y = 0.3(1.2)^x$

5. $y = -5\left(\frac{4}{5}\right)^x$

6. $y = 3(10)^{-x}$