7-5 Study Guide and Intervention

Exponential Functions

Graph Exponential Functions

Exponential Function	a function defined by an equation of the form $y = ab^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$

You can use values of x to find ordered pairs that satisfy an exponential function. Then you can use the ordered pairs to graph the function.

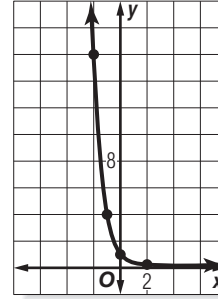**Example 1** **Graph $y = 3^x$. Find the y-intercept and state the domain and range.**

x	y
−2	$\frac{1}{9}$
−1	$\frac{1}{3}$
0	1
1	3
2	9
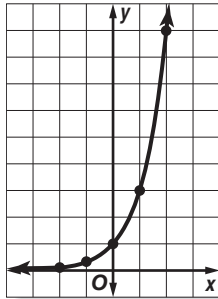
The y-intercept is 1.
The domain is all real numbers, and the range is all positive numbers.

Example 2 **Graph $y = \left(\frac{1}{4}\right)^x$. Find the y-intercept and state the domain and range.**

x	y
−2	16
−1	4
0	1
1	$\frac{1}{4}$
2	$\frac{1}{16}$

The y-intercept is 1.
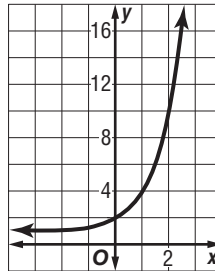The domain is all real numbers, and the range is all positive numbers.

Exercises

Graph each function. Find the y-intercept and state the domain and range.

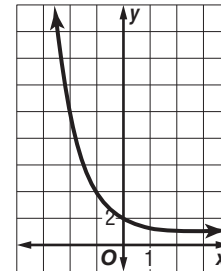**1.** $y = 0.3^x$

**1; D = {all real
numbers},
R = {y|y > 0}**

2. $y = 3x + 1$

**2; D = {all real
numbers},
R = {y|y > 1}**

3. $y = \left(\frac{1}{3}\right)^x + 1$

**2; D = {all real
numbers},
R = {y|y > 1}**

Lesson 7-5

7-5   Study Guide and Intervention *(continued)*

Exponential Functions

Identify Exponential Behavior It is sometimes useful to know if a set of data is exponential. One way to tell is to observe the shape of the graph. Another way is to observe the pattern in the set of data.
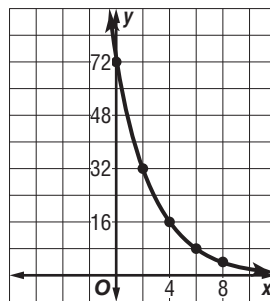
Example   **Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.**

x	0	2	4	6	8	10
y	64	32	16	8	4	2

Method 1: Look for a Pattern

The domain values increase by regular intervals of 2, while the range values have a common factor of $\frac{1}{2}$. Since the domain values increase by regular intervals and the range values have a common factor, the data are probably exponential.

Method 2: Graph the Data

The graph shows rapidly decreasing values of y as x increases. This is characteristic of exponential behavior.

Exercises

Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.

1.

x	0	1	2	3
y	5	10	15	20

No; the domain values are at regular intervals, and the range values have a common difference 5.

2.

x	0	1	2	3
y	3	9	27	81

Yes; the domain values are at regular intervals, and the range values have a common factor 3.

3.

x	−1	1	3	5
y	32	16	8	4

Yes; the domain values are at regular intervals, and the range values have a common factor $\frac{1}{2}$.

4.

x	−1	0	1	2	3
y	3	3	3	3	3

No; the domain values are at regular intervals, but the range values do not change.

5.

x	−5	0	5	10
y	1	0.5	0.25	0.125

Yes; the domain values are at regular intervals, and the range values have a common factor 0.5.

6.

x	0	1	2	3	4
y	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{27}$	$\frac{1}{81}$	$\frac{1}{243}$

Yes; the domain values are at regular intervals, and the range values have a common factor $\frac{1}{3}$.