7.7 Write and Apply Exponential and Power Functions

TEKS a.3, 2A.1.B, 2A.11.F

Before You wrote linear, quadratic, and other polynomial functions.

Now You will write exponential and power functions.

Why? So you can model biology problems, as in Example 5.

Key Vocabulary
- **power function,** *p. 428*
- **exponential function,** *p. 478*

In Chapter 2, you learned that two points determine a line. Similarly, two points determine an exponential curve.

EXAMPLE 1 Write an exponential function

Write an exponential function $y = ab^x$ whose graph passes through (1, 12) and (3, 108).

Solution

STEP 1 **Substitute** the coordinates of the two given points into $y = ab^x$.

$12 = ab^1$ Substitute 12 for y and 1 for x.

$108 = ab^3$ Substitute 108 for y and 3 for x.

STEP 2 **Solve** for a in the first equation to obtain $a = \frac{12}{b}$, and substitute this expression for a in the second equation.

$108 = \left(\frac{12}{b}\right)b^3$ Substitute $\frac{12}{b}$ for a in second equation.

$108 = 12b^2$ Simplify.

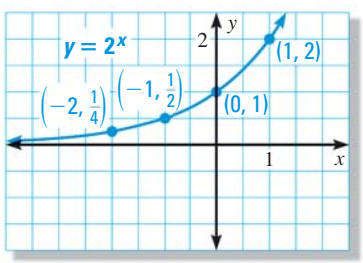
$9 = b^2$ Divide each side by 12.

$3 = b$ Take the positive square root because $b > 0$.

STEP 3 **Determine** that $a = \frac{12}{b} = \frac{12}{3} = 4$. So, $y = 4 \cdot 3^x$.

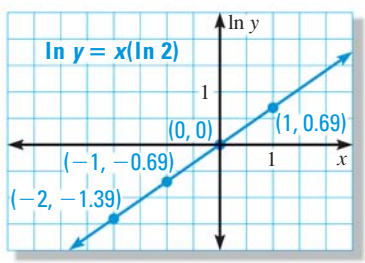
TRANSFORMING EXPONENTIAL DATA A set of more than two points (x, y) fits an exponential pattern if and only if the set of transformed points $(x, \ln y)$ fits a linear pattern.

Graph of points (x, y)



The graph is an exponential curve.

Graph of points (x, ln y)



The graph is a line.