

Example “7”: Writing an Exponential Function

A Supplement for Section 10-1

Use the equation of the exponential function whose graph passes through $(0,2)$, $(-3,16)$ to find the value of y when $x = 4$.

NOTE: This is a similar process to linear equations; if you are given two points, you can use them to find the slope and the y-intercept in order to make the form $y = mx + b$. In this case, you will need to find the a and the b in the basic exponential function, $y = ab^x$.

Exponential function: $y = ab^x$

1. SOLVE FOR THE **a**:

- Substitute the coordinate point which has 0 as the x-value. $2 = ab^0$.
- Any base raised to the power of 0 equal 1, so $b^0 = 1$, so $2 = a \cdot 1$.
- Solve and simplify: $a = 2$.

2. SOLVE FOR THE **b**:

- Rewrite the exponential function with the value for a : $y = 2b^x$.
- Substitute the other point in the exponential function to find the b :
 - $16 = 2b^{(-3)}$
 - $8 = b^{(-3)}$
 - $8 = \frac{1}{b^3}$
 - $8b^3 = 1$
 - $b^3 = \frac{1}{8}$
 - $b = \sqrt[3]{\frac{1}{8}}$
 - $b = \frac{1}{2}$

3. WRITE the completed exponential function with the a and the b : $y = 2\left(\frac{1}{2}\right)^x$.

4. USE the completed exponential function to find the value of y when $x = 4$.

$$y = 2\left(\frac{1}{2}\right)^4 \Rightarrow y = 2\left(\frac{1}{16}\right) \Rightarrow y = \frac{1}{8}$$