

Illustrative Mathematics

F-LE Two Points Determine an Exponential Function II

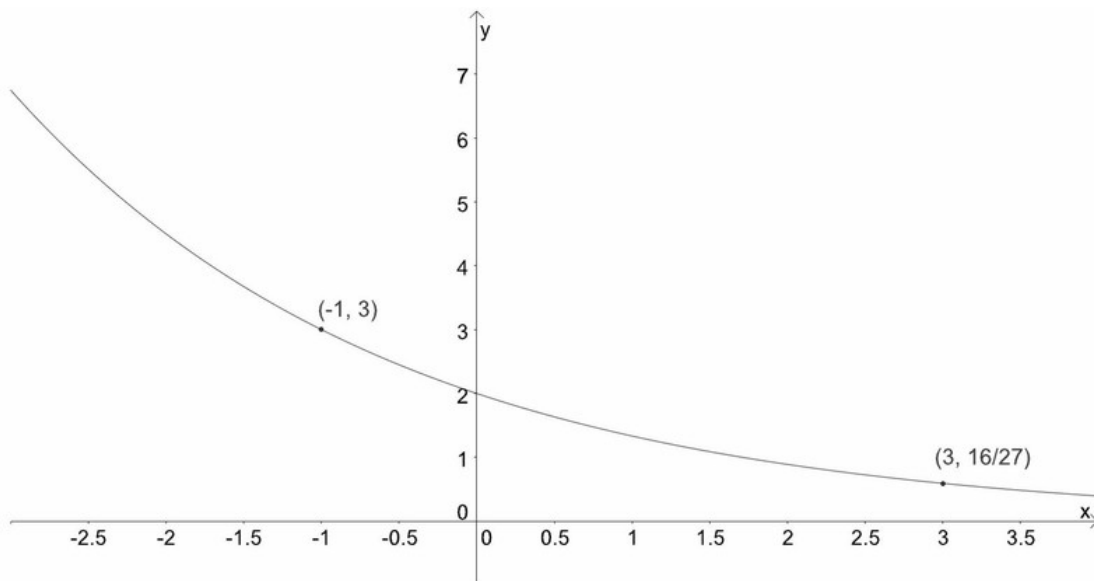
Alignments to Content Standards

- [Alignment: F-LE.A.2](#)

Tags

- *This task is not yet tagged.*

The graph of a function of the form $f(x) = ab^x$ is shown below. Find the values of a and b .



Commentary

An easier version of this problem is given in Two Points Determine an Exponential Function, I

Solutions

Solution: Two Points Determine an Exponential Function II, first method

The value of the function decreases from 3 to $\frac{16}{27}$ by multiplying 3 four times by b

$$3 \times b \times b \times b \times b = \frac{16}{27} \quad 3b^4 = \frac{16}{27} \quad b^4 = \frac{16}{81} \quad b = \pm \frac{2}{3}$$

The base, b , must be positive so $b = \frac{2}{3}$

Substituting the point $(-1, 3)$ yields

$$3 = a \frac{2^{-1}}{3} \quad \text{so } 3 = a \frac{3}{2} \quad \text{and } 2 = a$$

$$\text{So } f(x) = 2 \left(\frac{2}{3} \right)^x$$

Solution: Two Points Determine and Exponential Function II, second method

Substituting the point $(-1, 3)$ yields $3 = ab^{-1}$, so $3b = a$

Substituting the point $(3, \frac{16}{27})$ yields

$$\frac{16}{27} = ab^3 \quad \text{so } \frac{16}{27} = (3b)b^3 \quad \text{or } \frac{16}{27} = 3b^4 \quad \text{and } \frac{16}{81} = b^4 \quad \pm \frac{2}{3} = b$$

The base, b , must be positive so $\frac{2}{3} = b$ and since $3b = a$, $3 \left(\frac{2}{3} \right) = a$, or $a = 2$.

$$\text{So } f(x) = 2 \left(\frac{2}{3} \right)^x.$$

