

6.5 Solve Exponential Equations DAY TWO

What You Will Learn:

- Solve exponential equations with the same base.
- Solve exponential equations with unlike bases.
- Solve exponential equations by graphing.

Core Vocabulary:

exponential equation

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Solving Exponential Equations by Graphing

Sometimes, it is impossible to rewrite each side of an exponential equation using the same base. You can solve these types of equations by graphing each side and finding the point(s) of intersection. Exponential equations can have no solution, one solution, or more than one solution depending on the number of points of intersection.

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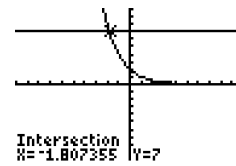
EXAMPLE 4 Solving Exponential Equations by Graphing

Use a graphing calculator to solve (a) $(\frac{1}{2})^{x-1} = 7$ and (b) $3^{x+2} = x + 1$.

(a) $y = \frac{1}{2}^{x-1}$
 $y = 7$

Plot1 Plot2 Plot3
 $\sqrt{Y1} = (\frac{1}{2})^{X-1}$
 $\sqrt{Y2} = 7$
 $\sqrt{Y3} =$
 $\sqrt{Y4} =$
 $\sqrt{Y5} =$
 $\sqrt{Y6} =$

$X = -1.807$



(b) $y = 3^{x+2}$
 $y = x + 1$

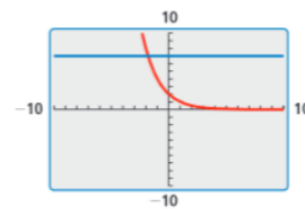
no solution

SOLUTION

a. Step 1 Write a system of equations using each side of the equation.

$y = (\frac{1}{2})^{x-1}$ Equation 1
 $y = 7$ Equation 2

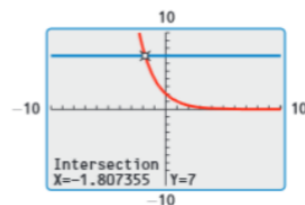
Step 2 Enter the equations into a calculator. Then graph the equations in a viewing window that shows where the graphs could intersect.



Check

$(\frac{1}{2})^{x-1} = 7$
 $(\frac{1}{2})^{-1.81-1} \stackrel{?}{=} 7$
 $7.01 \approx 7$ ✓

Step 3 Use the *intersect* feature to find the point of intersection. The graphs intersect at about $(-1.81, 7)$.



► So, the solution is $x \approx -1.81$.

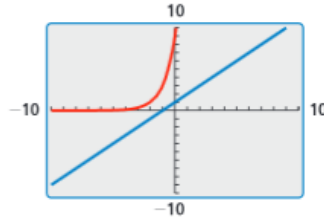
SOLUTION

b. Step 1 Write a system of equations using each side of the equation.

$y = 3^{x+2}$ Equation 1

$y = x + 1$ Equation 2

Step 2 Enter the equations into a calculator. Then graph the equations in a viewing window that shows where the graphs could intersect.



► The graphs do not intersect. So, the equation has no solution.

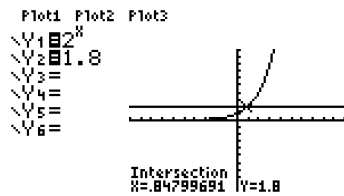
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Examples:

Use a graphing calculator to solve this equation.

1. $2^x = 1.8$

$y_1 = 2^x$
 $y_2 = 1.8$

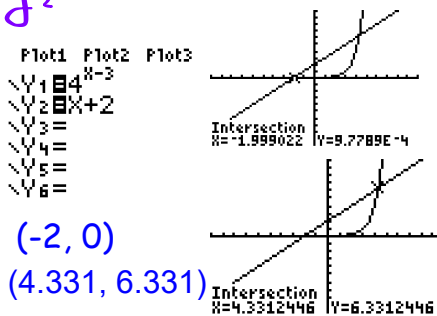


(.85, 1.8)

$x = 0.848$

2. $4^{x-3} = x + 2$

$y_1 = 4^{x-3}$
 $y_2 = x + 2$



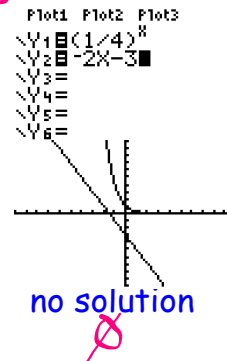
(-2, 0)

(4.331, 6.331)

$x = -2, 4.331$

3. $(\frac{1}{4})^x = -2x - 3$

$y_1 = (\frac{1}{4})^x$
 $y_2 = -2x - 3$



no solution

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6.5 DAY TWO Assignment:

WS problems ALL