Section 4.6

Logarithmic and Exponential Equations

OBJECTIVE 1

Solve Logarithmic Equations Using the Properties of Logarithms

EXAMPLE Solving a Logarithmic Equation

Solve: $\log_3 4 = 2\log_3 x$

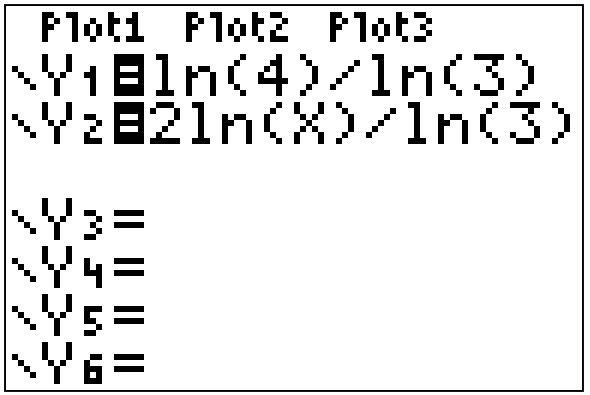
Algebraic Solution

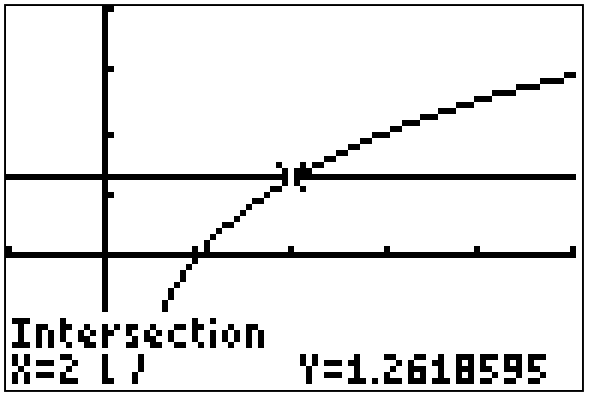
$$\log_a M^r = r \log_a M$$

If $\log_a M = \log_a N$, then $M = N$.

Reminder: Logarithms of negative numbers are not defined so check for extraneous solutions.

Graphing Solution





EXAMPLE Solving a Logarithmic Equation

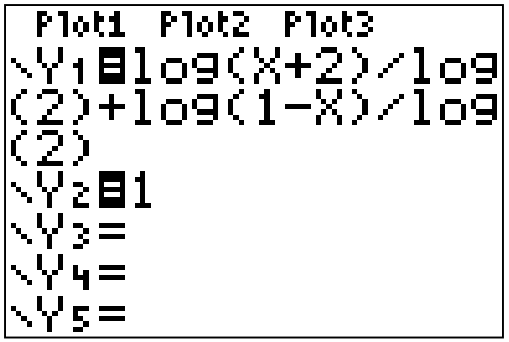
Solve: $\log_2(x+2)+\log_2(1-x)=1$

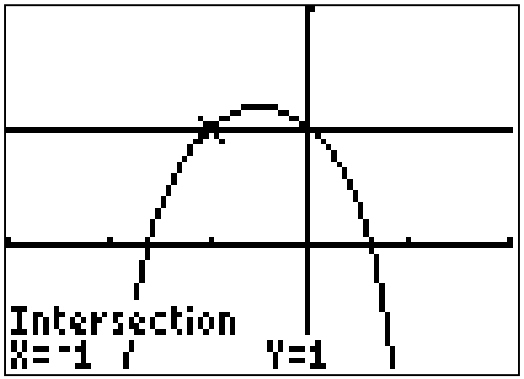
Algebraic Solution

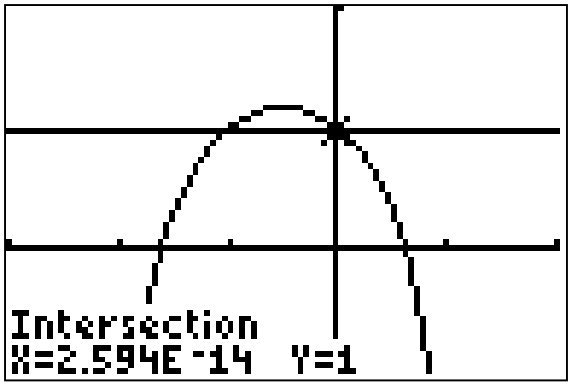
$$\log_a(MN) = \log_a M + \log_a N$$

$$y = \log_a x \quad \text{if and only if} \quad x = a^y$$

Graphing Solution







OBJECTIVE 2

Solve Exponential Equations

EXAMPLE

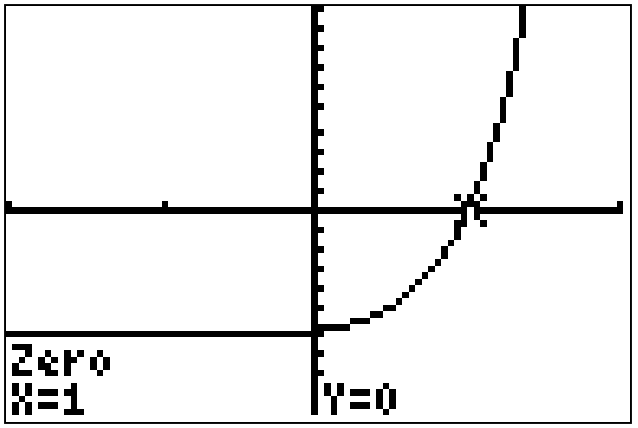
Solving an Exponential Equation

Solve: $9^x - 3^x - 6 = 0$

Algebraic Solution

Hint: If you replace 9^x with $\left(3^x\right)^2$ then the equation is quadratic in form.

Graphing Solution



EXAMPLE

Solving an Exponential Equation

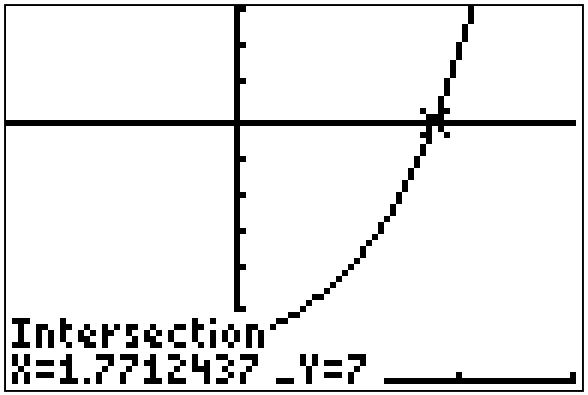
Solve: $3^x = 7$

Algebraic Solution

If $M = N$, then $\log_a M = \log_a N$.

$\log_a M^r = r \log_a M$

Graphing Solution



EXAMPLE

Solving an Exponential Equation

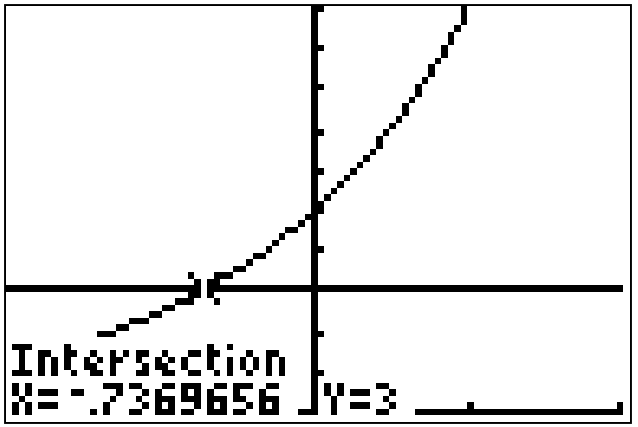
Solve: $5 \cdot 2^x = 3$

Algebraic Solution

If $M = N$, then $\log_a M = \log_a N$.

$\log_a M^r = r \log_a M$

Graphing Solution



EXAMPLE

Solving an Exponential Equation

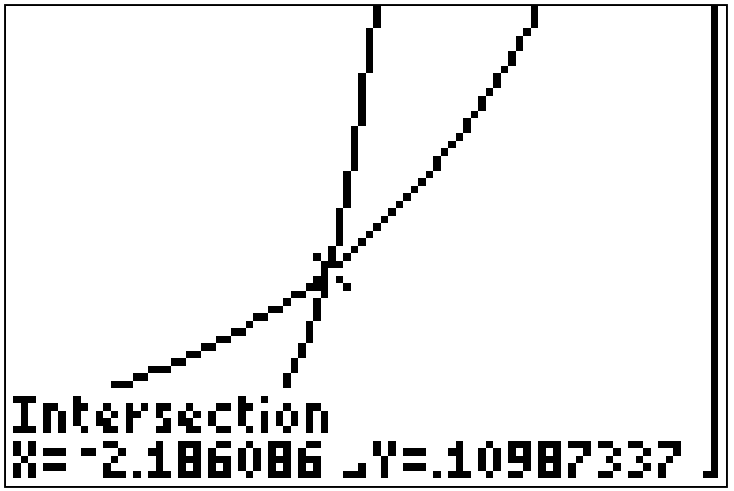
Solve: $2^{x-1} = 5^{2x+3}$

Algebraic Solution

If $M = N$, then $\log_a M = \log_a N$.

$\log_a M^r = r \log_a M$

Graphing Solution



OBJECTIVE 3

Solve Logarithmic and Exponential Equations Using a Graphing Utility

EXAMPLE

Solving Equations Using a Graphing Utility

Solve: $x + e^x = 2$

Express the solution(s) rounded to two decimal places.