Looking Ahead

Being familiar with the main properties of logarithms and logarithmic functions allows you to tackle logarithmic and exponential equations without the need of a calculator. In the example below, you will use many of those skills to determine the value of x in an exponential equation.

Example Preview

Solve the following exponential equation.

$$e^{2x} + 4e^{x} - 45 = 0$$

Solution

This equation is in quadratic form. First, solve for e^x by factoring. Then, solve for x by converting from exponential to logarithmic form.

$$\begin{aligned}(e^x - 5)(e^x + 9) &= 0\\ e^x &= 5, -9\\ x &= \ln(5), \ln(-9)\end{aligned}$$

Since $\ln(-9)$ is undefined, the only solution is $\ln(5)$.

6.R.4 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so that the statement will be true. (**Note:** There may be more than one acceptable change.)

1. Exponential functions of the form $y = b^x$ are one-to-one functions and have inverses.

2. The exponent of an exponential function is the base of its inverse logarithmic function.

3. Exponents are logarithms.

4. The logarithm of the base is always 1.

Practice

5. Express $7^2 = 49$ in logarithmic form.

6. Express $\log_5 125 = 3$ in exponential form.

Solve by first changing each equation to exponential form.

7. $\log_5 \frac{1}{125} = x$

8. $\log_x 121 = 2$

9. $\log_8 8^{3.7} = x$

Graph the function and its inverse on the same set of axes.

10. $f(x) = 2^x$

Writing & Thinking

11. Discuss, in your own words, the symmetrical relationship of the graphs of the two logarithmic functions $y = \log_{10} x$ and $y = -\log_{10} x$.