

Algebra 2B Notes

Name: _____

7- 6 Natural Logarithms

Date: _____ Hr: _____

Objective:

- To evaluate and simplify natural logarithmic expressions
- To solve equations using natural logarithms

Common Core Content Standard:

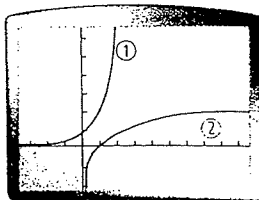
F.LE.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a , c , and d are numbers and the base b is 2, 10, or e ...

The inverse of the function $y = e^x$ is the _____ logarithmic function, $y = \log_e x$, or $y = \ln x$.

Take note

Key Concept Natural Logarithmic Function

If $y = e^x$, then $x = \log_e y = \ln y$. The natural logarithmic function is the inverse of $x = \ln y$, so you can write it as $y = \ln x$.



① $y = e^x$
② $y = \ln x$

Example 1: Simplifying a Natural Logarithmic Expression

What is each expression written as a single natural logarithm?

a. $3\ln 2 - 3\ln x$

b. $2\ln 3 + \ln 8$

c. $20\ln x + 5\ln y - 2\ln z$

Example 2: Solving a Natural Logarithmic Equation

What are the solutions of each equation?

a. $\ln x = 5$

b. $\ln(6x + 1) = 3$

c. $\ln(2x + 1)^2 = 6$

Example 3: Solving an Exponential Equation

What is the solution of each equation?

a. $e^{x+3} = 24$

b. $5e^{-3x} = 45$

c. $2e^{5x} - 8 = 30$

Example 4: Using Natural Logarithms

Carbon dating is a method used to determine the age of organic material less than 50,000 years old.

One of the formulas for carbon-14 dating is $t = \frac{\ln\left(\frac{N_f}{N_o}\right)}{-0.693} \times 5700$ where $\frac{N_f}{N_o}$ is the percent of carbon-14 remaining and t is the time in years. A fossil is found to have 30% carbon-14 compared to a living sample. Using this formula, what is the age of the fossil?