

4.4 Exponential and Logarithmic Equations

Equations Involving Logarithms

Example Solve

- 1.
2. $\log_2 x + \log_2(x + 2) = \log_2(6x + 1)$
3. $\log x - \log(x - 1) = 2$
4. $2 \ln x = \ln(x + 3) + \ln(x - 1)$

Equations Involving Exponents

Example Solve. Give the exact value.

1. $20 = 4e^{3t}$
2. $2^{4t-1} = 5$
3. $3^{2x-1} = 5^x$

Applications

Radioactive decay is given by the formula $A = A_0e^{-kt}$. The half-life, h , is the time that it takes for half of a radioactive substance to decay. This is a constant depending on the element.

Example The half-life of carbon-14 is 5730 years. An artifact is found to contain 80% of its original amount carbon-14. Find the constant k for carbon-14 and write a function that gives the amount of carbon-14 at time t years. How old is the object?

Example In 1964, *Deinonychus* was discovered. Its age was determined by looking at the surrounding rocks and using potassium-argon dating. The half-life of potassium-40 is 1.31 billion years. If 94.5% of the original amount of potassium-40 is still present in the rock, then how old are the bones of *Deinonychus*?

SOLUTION Approximately 107 million years.