

Evaluate using a calculator. Round to three decimal places.

1.  $\ln 27$
2.  $\ln \frac{2}{3}$
3.  $\ln(-18)$

Simplify each expression.

4.  $e^{\ln 7}$
5.  $-16e^{\ln 2}$
6.  $2 \ln e^{10}$

Expand each expression.

7.  $\ln ab^3c^5$
8.  $\ln \frac{6m}{k^2}$

Condense each expression.

9.  $\ln 2 + 3 \ln g + 2 \ln h$
10.  $4 \ln 3 + \frac{1}{3} \ln y - 2 \ln z$

Solve each equation using the natural logarithm function.

11.  $4^x = 15$
12.  $20^x = 8$

Solve each equation.

13.  $14 \ln x = 70$
14.  $\ln(x + 7) = 8$
15.  $-25 \ln x = 5$
16.  $\ln(x - 10) = 16$

Use the formula  $N(t) = N_0 e^{-0.00012t}$  to solve.

17. A piece of charcoal from an ancient campsite is found in an archeological dig. It contains 9% of its original amount of carbon-14. Estimate the age of the charcoal.