**Problem 1.** Solve the equation \( \ln(x + 1) = \ln(4/x) + \ln(3) \).

*Solution.* We combine the logarithms on the RHS first:

\[
\ln(x + 1) = \ln\left(\frac{4}{x} \cdot 3\right)
\]

\[
\ln(x + 1) = \ln\left(\frac{12}{x}\right);
\]

Applying \( e^x \) to both sides we get \( x + 1 = 12/x \) or \( x^2 + x - 12 = 0 \). Therefore \( x = -4 \) or \( x = 3 \).

The check shows that \( x = -4 \) is not a solution (e.g. \( \ln(x + 1) \) does not exists) and \( x = 3 \) is. Answer: one solution, \( x = 3 \). \( \square \)

**Problem 2.** The mass \( m(t) \) remaining after \( t \) years from a sample of some radioactive substance is given by \( m(t) = m_0 e^{-0.012t} \), where \( m_0 \) is the initial mass. Find the half life of this substance.

*Solution* We want to find \( t \) such that

\[
m_0/2 = m_0 e^{-0.012t}.
\]

Divide by \( m_0 \) and apply \( \ln \):

\[
1/2 = e^{-0.012t},
\]

\[
\ln(1/2) = -0.0124t,
\]

\[
t = \ln(1/2) / -0.0124 \approx 55.90 \text{years}.
\]