2.6 Natural Logarithms & Base e

SWBAT solve logarithmic equations involving natural logs and base e.

Natural base exponential function:
$$y = e^x$$

Natural Logarithm:
logarithm with base e

Natural logarithm function:
y = ln x

Evaluate Natural Base Expressions:
simply type "2nd eˣ (insert number) enter" in your calculator

a) $e^{0.5}$

b) e^{-8}

c) e^2

d) $e^{-1.3}$

Evaluate Natural Base Expressions:
simply type "ln (insert number) enter" in your calculator

a) ln 3

b) ln $\dfrac{1}{4}$

c) ln 4

d) ln 0.05

Example 3: Write each expression as a single natural logarithm.
Use the properties of logs to condense!

a) $3\ln 5$

b) $\ln 24 - \ln 6$

c) $\dfrac{1}{3}(\ln x + \ln y) - 4\ln z$

d) $2\ln 8 - 3\ln 4$

Example 1: Simplify the expression

a) $\dfrac{\ln e^4}{8}$

b) $\ln e^{83}$

Example 2: Simplify the expression

a) $10\ln e$

b) $\ln 1$

Example 4: Solve Base e Equations

After isolating the e, use ln on each side to cancel out the e

a) $e^{\frac{x}{4}} + 3 = 9$

b) $5e^{-x} - 7 = 2$

c) $3e^{-2x} + 4 = 10$

d) $e^{3x+1} = e^{13}$

Example 5: Solve Natural Log Equations

After isolating the ln, use e on each side to cancel out the ln

a) $\ln 5 - \ln x = 4$

b) $\ln(2m + 3) = 8$

c) $\ln\dfrac{x-3}{4} = 8$

d) $3\ln 3x^2 = 1$

Applications of Natural Logs and Base e

Example 6: How much money will be in a bank account after 1.5 years if you invested $400 at 7.6% compounded continuously?

Practice: Complete the following problems for class work. Show all work.

1. Solve ln(14x – 3) = ln(7x + 11)

2. Solve 2e^x – 5 = 1

3. ln(x – 1) = -2

4. ln(2x – 3) = 2.5

5. ln 48 – lnx = ln4

6. e^{3x} · e^x = 15

Mixed Review: Remember, *all* logarithms share the same rules. Always condense first before solving!

7. $4^{3x} = 12$

8. $log_6 x + log_6 9 = log_6 54$

9. log$_2$ x = −3

10. log$_2$ 64 = x

11. log$_2$x – log$_2$ 5 = 3

12. ln4x + ln 5 = ln 20

13. Mazie invested $4500 in an account earning 4.3% interest compounded continuously. After how many years will she have $7400 in her account?