

### Base $e$ and Natural Logarithms

$e$  is referred to as the natural base, or the Euler Number. An exponential function with base  $e$  is called a natural base exponential function.

The inverse of a natural base exponential function is called the \_\_\_\_\_.

$$\log_e x = \ln x, \text{ or for example } \ln 4 = x \rightarrow \log_e 4 = x \rightarrow e^x = 4$$

**Write an equivalent exponential or logarithmic function.**

$$e^x = 8$$

$$e^5 = x$$

$$\ln 25 = x$$

**Write the expression as a single logarithm.**

$$3 \ln 10 - \ln 8$$

$$2 \ln 5 + 4 \ln 2 + \ln 5y$$

**Solve each equation or inequality.**

$$4e^{-2x} - 5 = 3$$

$$3e^{4x} - 12 = 15$$

$$3 \ln 4x = 24$$

$$5 \ln 6x > 8$$

### **Continuously Compounded Interest:**

When interest is compounded continuously, the amount  $A$  in an account after  $t$  years is given by the formula:

$$A = Pe^{rt}$$

Where  $P$  is the principal and  $r$  is the annual interest rate expressed as a decimal.

When Angelia was born, her grandparents deposited \$3000 into a college savings account paying 4% interest compounded continuously.

- Assuming there are no deposits or withdrawals from the account, what will the balance be after 10 years?
  
- How long will it take the balance to reach at least \$10,000?
  
  
  
  
  
  
  
  
  
- If her grandparents want Angelia to have \$10,000 after 18 years, how much would they need to invest?