

# Logarithmic Functions

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## Logarithms



- Used to find unknown exponents in exponential models
- Define many measurement scales in the sciences such as the pH, decibel, and Richter scales.

## Logarithmic Function



- $\log_a x = y \Leftrightarrow a^y = x$
- It's the inverse of the exponential function

For any positive base  $b$ , where  $b \neq 1$ :  
 $b^x = y$  if and only if  $x = \log_b y$



Exponential Form

$$10^3 = 1000$$

Logarithmic Form

$$\log_{10} 1000 = 3$$

$$\log_{10} 1000 = 3$$



**Write in logarithmic form.**

$$5^3 = 125$$

exponential  
form  
↓

$$\log_5 125 = 3$$

logarithmic  
form

Write in logarithmic form.

$$6^4 = 1296$$

$$\log_6 1296 = 4$$



Write in logarithmic form.

$$3^{-3} = \frac{1}{27}$$

$$\log_3 \frac{1}{27} = -3$$

## Natural log

$$\log_e x = \ln x$$

↑  
natural  
log

Common log

$$\log_{10} x = \log x$$

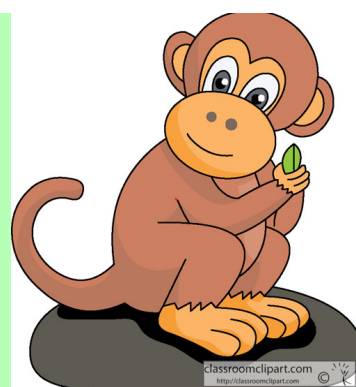


Write in logarithmic form.

$$e^2 = 7.389...$$

$$\log_e 7.389 \approx 2$$

$$\ln 7.389 = 2$$



Write in exponential form.

$$\log_3 81 = 4$$

$$3^4 = 81$$

logarithmic  
form  
↓  
exponential  
form

Write in exponential form.

$$\log_8 512 = 3$$

$$8^3 = 512$$

**Write in exponential form.**

$$\ln(181.3) = 5.2$$

$$e^{5.2} = 181.3$$

**Write in exponential form.**

$$\log_3 \frac{1}{9} = -2$$

$$3^{-2} = \frac{1}{9}$$

HW  
1-16  
all