

Definition of Common Logarithms

Let u and v be real numbers, with $v > 0$. Then

$$\log v = u \quad \text{exactly when} \quad 10^u = v.$$

In other words,

$\log v$ is the exponent to which 10 must be raised to produce v .

Definition of Natural Logarithms

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$\ln v$ is the exponent to which e must be raised to produce v .

Properties of Logarithms

Natural Logarithms

1. $\ln v$ is defined only when $v > 0$;
2. $\ln 1 = 0$ and $\ln e = 1$;
3. $\ln e^k = k$ for every real number k ;
4. $e^{\ln v} = v$ for every $v > 0$;

Common Logarithms

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- $\log 1 = 0$ and $\log 10 = 1$.
- $\log 10^k = k$ for every real number k .
- $10^{\log v} = v$ for every $v > 0$.

Exponential Functions

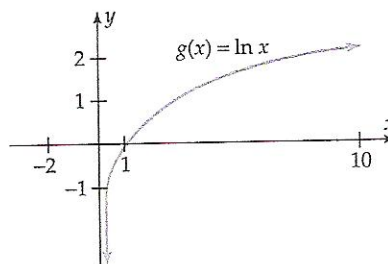
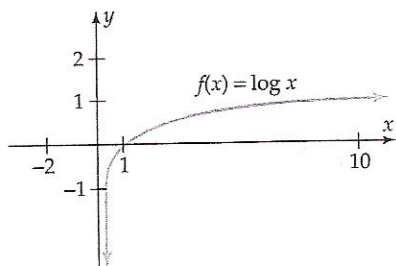
Every exponential growth or decay function can be written in the form

$$f(x) = Pe^{kx},$$

where $f(x)$ is the amount at time x , P is the initial quantity, and k is positive for growth and negative for decay.

Domain: all positive real numbers
Range: all real numbers

x-intercept: 1
Vertical Asymptote: y-axis



Handout for
section
5.3