

December 3

What is the inverse function for

$$y = \sin(x)$$

$$y = \sin^{-1}(x)$$

$$y = \cos(x)$$

$$y = \cos^{-1}(x)$$

$$y = x^2$$

$$y = \sqrt{x}$$

Where can you find these buttons on the calculator?

December 3

Students will verbally explain how to graph and simplify logarithmic function

(using the words:  
product, sum, power...)

What is the inverse function for  $y = 10^x$ ?

$$y = \log(x)$$
$$y = \log_{10}(x)$$

Inverse of  $2^x$ ?  
 $\log_2 x$

What is the inverse function for  $y = e^x$ ?

$$y = \ln(x)$$
$$y = \log_e(x)$$

Inverse of  $71^x$ ?  
 $\log_{71} x$

What is  $e$ ?

$e = 2.718281828...$

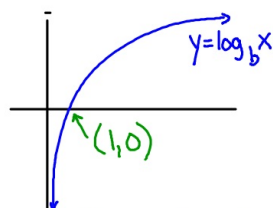
It is irrational - there are no repeating decimals, like  $\pi$

$\pi$  is the ratio of the circumference to the diameter of a circle....that is  $C = kd$ , where  $k$  is a constant and specifically  $k$  is  $\pi$ . Similarly  $A = kr^2$ , where  $k$  is again  $\pi$ .

$e$  is similar in that it is the base of the log that determines the area under the curve  $y = \frac{1}{x}$  from  $x = 1$  to  $x = t$ .  
 $e$  is a number that occurs naturally in the world, and makes life much easier when using it as a base of a log....the natural log.

$$\ln(x)$$

## Properties of Log Functions



- x-intercept at  $(1, 0)$
- no y-intercepts
- ⇒ vertical asymptote  $x = 0$
- Domain:  $x > 0$
- $\ln(x)$  is undefined when  $x$  is zero or negative

Rewrite in logarithmic form

$$2^5 = 32$$

$$e^x = 4$$

Evaluate each expression

$$\log_2(16)$$

$$y = b^x \rightarrow \log_b y = x$$
$$32 = 2^5 \rightarrow \log_2 32 = 5$$

base      answer      exponent

$$4 = e^x \rightarrow \log_e 4 = x$$
$$\ln(4) = x$$

$$\log_2 16 = x$$

① rewrite in exponential form

$$2^x = 16$$

② write both terms with the same base

$$2^x = 2 \cdot 2 \cdot 2 \cdot 2 = 2^4$$
$$2^x = 2^4$$

③ set exponents equal + solve

$$x = 4$$

$$\log_8(32)$$

$$\log_8(32) = x$$

① write as exponent

$$8^x = 32$$

② same base

$$32 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$$
$$8 = 2 \cdot 2 \cdot 2 = 2^3$$
$$(2^3)^x = 2^5$$
$$2^{3x} = 2^5$$

③ set exponents = and solve

$$\frac{3x}{3} = \frac{5}{3}$$
$$x = \frac{5}{3}$$

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