e and ln

Return to
Table of
Contents

Basic Properties of Natural Logs

$$\ln(mn) = \ln(m) + \ln(n)$$

$$\ln\left(\frac{m}{n}\right) = \ln(m) - \ln(n)$$

$$\ln(m^n) = n\ln(m)$$

$$ln1 = 0$$

$$lne = 1$$

$$ln e^y = y$$

$$e^{ln\,x} = x$$

e and ln

The letter e represents a number that occurs quite often when dealing with exponential functions. It is a number used to model such things as the growth of a bacteria colony, the spread of an oil spill and even calculating compound interest.

Formally, e is defined to be:

$$e = \lim_{x \to \infty} \left(1 + \frac{1}{n}\right)^n$$

Simply, as a number:

$$e = 2.71818182...$$

*e is an irrational number similar to *pi* in the sense that it will never repeat and never ends...

e and ln

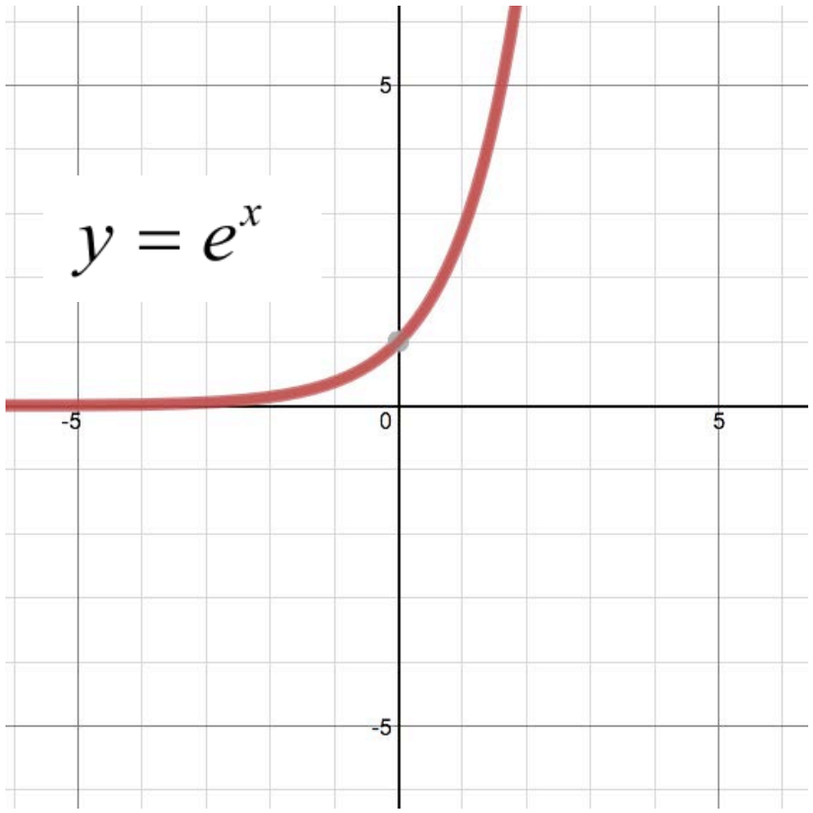
As with exponential functions, we can find the inverse of a function with base e. This is called The Natural Log and is noted:

$$\log_e x = \ln x$$

*Find *ln* on your calculator. This is $\log_e$.

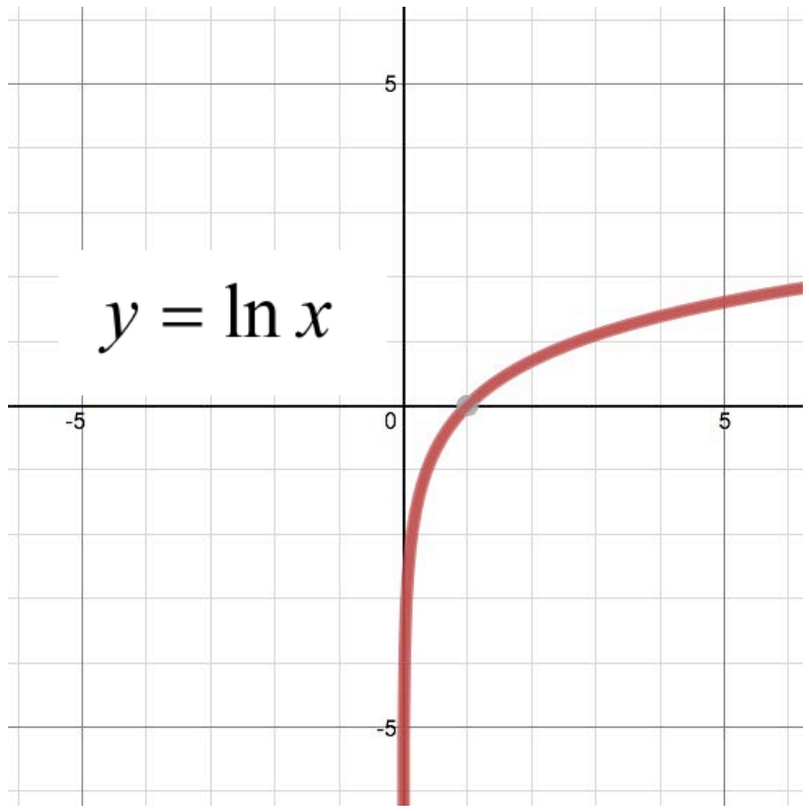
e and ln

The graphs of e and ln are similar to our other functions.
The domain and range also remain the same.



$Domain : (-\infty, \infty)$

$Range : (0, \infty)$



$Domain : (0, \infty)$

$Range : (-\infty, \infty)$

e and ln

e and natural logs have all of the same properties as other exponentials and logarithms.

For example:

$$\ln\left(e^{7}\right) = 7 \qquad e^{\ln 6} = 6 \qquad \ln 1 = 0$$

because

$$\ln e^{y} = y$$

because

$$e^{\ln x} = x$$

e and ln

Write each of the following in the equivalent exponential or log form.

$\ln 10 = x$

$e^4 = 5x$

Answer

e and ln

Rewrite each of the following as a single logarithm:

$2\ln x + 3\ln y$

$4\ln x - 3\ln y + \ln z$

Answer

e and ln

Expand the following logarithms:

$$\ln(10m^4n^3)$$

$$\ln\left(\frac{6n^4}{m^3}\right)$$

Answer

95 Rewrite as a single logarithm:

$$\ln 6 + \ln 4 - 3\ln x$$

A $\ln 24x^3$

B $\ln\left(\frac{6}{4x^3}\right)$

C $\frac{\ln 24}{\ln x^3}$

D $\ln\left(\frac{24}{x^3}\right)$

Answer

96 Expand the logarithm: $\ln(2x^7yz^4)$

A $\ln 2 + 14\ln x + 2\ln y + 8\ln z$

B $\ln 2 + 7\ln x + \ln y + 4\ln z$

C $14\ln x + 2\ln y + 8\ln z$

D $56\ln x + 56\ln y + 56\ln z$

Answer

97 Expand the logarithm: $\ln\left(\frac{em^6}{n^4}\right)$

A $24\ln m - 24\ln n$

B $1 + 6\ln m - 4\ln n$

C $e\ln m - 4\ln n$

D $6\ln e + 6\ln m - 4\ln n$

Answer

98 Rewrite as a single logarithm:

$$6\ln a - 4\ln b - 3\ln c$$

A $\ln\left(\frac{a^6}{b^4c^3}\right)$

B $\ln\left(\frac{a}{b^4c^3}\right)^6$

C $\ln\left(\frac{1}{a^6b^4c^3}\right)$

D $\ln a^6b^4c^3$

Answer

e and ln

Solve the following equations:

$e^x = 5$

$4e^{3x} = 28$

Answer

e and ln

Solve the following equations:

$$\ln x = 5$$

$$\ln(3x) + \ln(2x) = 10$$

Answer

99 Find the value of x.

$$e^{\ln 5} = x$$

Answer

100 Find the value of x.

$$\ln e^{7} = x$$

Answer

101 Find the value of x.

$$e^{x+2} = 6$$

Answer

102 Find the value of x.

$$5e^{2x+1} - 2 = 8$$

Answer

103 Find the value of x.

$$\ln x = 3$$

Answer

104 Find the value of x.

$$\frac{\ln x^2}{4} = 5$$

Answer