

Change of base

→ Change of base formula:

$$\log_b a = \frac{\log_c a}{\log_c b}$$

Use the change of base formula to evaluate $\log_4 9$ to 3 significant figures.

Answer

$$\begin{aligned}\log_4 9 &= \frac{\log 9}{\log 4} \\ &= 1.58 \text{ (3 sf)}\end{aligned}$$

*Change the log to base 10.**Use calculator to evaluate answer.*

Nov 2-11:47 AM

$\log_x 3 = a$ and $\log_x 6 = b$.
Find $\log_3 6$ in terms of a and b .

Answer

$$\begin{aligned}\log_3 6 &= \frac{\log_x 6}{\log_x 3} \\ &= \frac{b}{a}\end{aligned}$$

Use the change of base formula.

$$\log_{\pi} 2 = L \quad \log_{\pi} X = A$$



Express $\log_2 X$ in terms of L & A

$$\frac{\log X}{\log 2} = \frac{\log_{\pi} X}{\log_{\pi} 2} = \frac{A}{L}$$

Oct 29-2:02 PM

4.7 Exponential and logarithmic equations

Solving exponential equations

Solve $5^x = 9$

$$\log_5(5^x) = \log_5 9$$

$$x = \log_5 9 \quad \text{or} \quad \frac{\log 9}{\log 5}$$

Solve $5^x = 9$

Answer

$$5^x = 9$$

$$\log 5^x = \log 9$$

$$x \log 5 = \log 9$$

$$x = \frac{\log 9}{\log 5}$$

$$x = 1.3652\dots$$

$$x = 1.37 \text{ (3 sf)}$$

Take logs of both sides.
Now bring down the exponent.
Rearrange the equation.

Check whether the question requires an exact answer

Nov 2-11:52 AM

Solve $6^x = 3^{x+1}$ giving your answer in the form $\frac{\ln a}{\ln b}$ where a and b are integers.

Answer

$$6^x = 3^{x+1}$$

$$\ln 6^x = \ln 3^{x+1}$$

$$x \ln 6 = (x+1) \ln 3$$

$$x \ln 6 = x \ln 3 + \ln 3$$

$$x \ln 6 - x \ln 3 = \ln 3$$

$$x(\ln 6 - \ln 3) = \ln 3$$

$$x = \frac{\ln 3}{\ln 6 - \ln 3} \approx \log_2 3$$

Take natural logs of both sides.
Bring down the exponents.
Multiply out brackets.
Collect x -terms together.
Factorize and divide.

$$\ln a - \ln b = \ln \frac{a}{b}$$



Nov 2-11:59 AM

Solve $e^{3x} = 5^{1-x}$, giving an exact answer.

Answer

$$\begin{aligned}
 e^{3x} &= 5^{1-x} \\
 \ln e^{3x} &= \ln 5^{1-x} \\
 3x &= (1-x) \ln 5 \\
 3x &= \ln 5 - x \ln 5 \\
 3x + x \ln 5 &= \ln 5 \\
 x(3 + \ln 5) &= \ln 5 \\
 x &= \frac{\ln 5}{3 + \ln 5}
 \end{aligned}$$

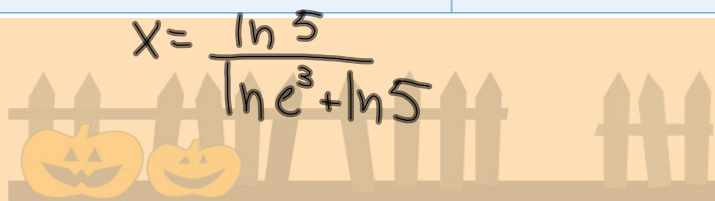
Use natural logs since $\ln e^x = x$

Bring down the exponents.

Multiply out brackets.

Collect x -terms together.

Factorize and divide.



$$x = \frac{\ln 5}{\ln e^3 + \ln 5}$$

$$x = \frac{\ln 5}{\ln(5e^3)}$$

$$x = \log_{5e^3}(5)$$

Nov 2-12:00 PM