TTH-PT Pre-Calculus : Trigonometry

Logarithmic form

$\log_{10} 8 = X$

Exponential form

$10^X = 8$

$\log_6 a = 12$

$6^{12} = a$

$\ln 64 = \log_e 64 = X$

$e^X = 64$

64 | ln | log

Change of Base

$\log 10^X = \log 8$

$X \log 10 = \log 8$

$\frac{X \log 10}{\log 10} = \frac{\log 8}{\log 10}$

$X = \frac{\log 8}{\log 10} = \frac{\log 8}{1} = \log 8$

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

$10^X = 10^1$

$X = 1$

"e" ~~log~~ ln

$e^x = 64$

$\ln e^x = \ln 64$

$\frac{x \ln e}{\ln e} = \frac{\ln 64}{\ln e}$

$x = \frac{\ln 64}{\ln e} = \ln 64$

$\ln e = \log_e e$

$\log_e e = x$

$e^x = e^1$ $\quad x = 1$

Exponential form

$8^x = 412$ (base → 8)

Logarithmic form

$\log_8 412 = x$ (base ↑ 8)

Exponential form

$2^9 = x$

Logarithmic form

$\log_2 x = 9$

Nate was "allegedly" hit by a "car" and "sued" a "person" for "$10,000".

"Nate" wants to "use" his "ill-gotten" "money" to "purchase" a "soft serve" machine.

First, if rate = 9% compounded continuously for 5 years, how much will he "have"?

$A = Pe^{rt}$ $A = 10{,}000\,e^{(0.09)(5)}$

$A = 10{,}000\,e^{0.45} = \boxed{\$15{,}683.12}$

An actual iron man suit is $78,000. How long would it take for the $10,000 to become $78,000?

$A = Pe^{rt}$ (9% $t = ?$)

$\frac{78{,}000}{10{,}000} = \frac{10{,}000\,e^{0.09x}}{10{,}000}$

$\ln 7.8 = \ln e^{0.09x}$

$\ln 7.8 = 0.09x \ln e$ ($\ln e = 1$)

$\ln 7.8 = 0.09x$

$\frac{\ln 7.8}{0.09} = \frac{0.09x}{0.09}$

$x = \frac{\ln 7.8}{0.09} = \boxed{22.8 \text{ yrs}}$

$\ln 7.8 = \ln e^{0.09x}$

Change of Base

Expanding Logarithms

$$\left[\log\left(\frac{(\overset{4}{10{,}000})(\overset{3}{1{,}000})}{100}\right)\right] = \log \frac{\overset{7}{10{,}000{,}000}}{\underset{2}{100}}$$

$$\log \overset{5}{100{,}000}$$

mult add $\underline{10}^4 * \underline{10}^3 = 10^{4+3} = 10^7$

divide sub $\frac{10^7}{10^2} = 10^{7-2} = 10^5$

$$\log\left(\frac{(10{,}000)*(1{,}000)}{100 \div}\right) =$$

$$\log_{10} 100{,}000 = 5$$

$$\log_{10} 100{,}000 = x$$

$$10^x = 100{,}000$$

$$10^x = 10^5 \quad \boxed{x = 5}$$

$$\log 10{,}000 + \log 1{,}000 - \log 100$$

$$\Downarrow \qquad \Downarrow \qquad \downarrow$$

$$4 + 3 - 2$$

$$7 - 2 = \boxed{5}$$

expanded

$$\log\left(\frac{ac}{de}\right) = \boxed{\log a + \log c - \log d - \log e}$$

$$\log\left(\frac{(10{,}000)(1{,}000)}{100}\right) = \log\left(\frac{(10^4)(10^3)}{10^2}\right)$$

$\log 10^4 + \log 10^3 - \log 10^2$ $\quad \log_{10} 10$

$4 \log 10^1 + 3 \log 10^1 - 2 \log 10^1$

$4(1) + 3(1) - 2(1)$

$4 + 3 - 2 = \boxed{5}$

$$\log\left(\frac{a^7 b^8}{c^4}\right) \qquad \log_2\left(\frac{x^9}{y^7 z^3}\right)$$

$\log a^7 + \log b^8 - \log c^4$ $\qquad \log_2 x^9 - \log_2 y^7 - \log_2 z^3$

$\boxed{7 \log a + 8 \log b - 4 \log c}$ $\qquad \boxed{9 \log_2 x - 7 \log_2 y - 3 \log_2 z}$

Expanded

$3 \log_4 x + 2 \log_4 y - 8 \log_4 z$

Condensed

$$\log_4\left(\frac{x^3 y^2}{z^8}\right)$$

$$\log_b\left(\frac{x^{\frac{1}{2}}}{y^{\frac{2}{3}}}\right) = \log_b x^{\frac{1}{2}} - \log_b y^{\frac{2}{3}}$$

$$\boxed{\frac{1}{2}\log_b x - \frac{2}{3}\log_b y}$$

$$\log_8\left(\sqrt{r}\sqrt[3]{t}\right) = \log_8 \sqrt{r} + \log_8 \sqrt[3]{t}$$

$$\log_8 r^{\frac{1}{2}} + \log_8 t^{\frac{1}{3}}$$

$$\boxed{\frac{1}{2}\log_8 r + \frac{1}{3}\log_8 t}$$

$$\log\left((x^2)(\sqrt{x+5})\right) = \log x^2 + \log\sqrt{x+5}$$

$$\log x^2 + \log (x+5)^{\frac{1}{2}}$$

$$\boxed{2\log x + \frac{1}{2}\log(x+5)}$$

$$\log_8\left(\frac{x^2+3x-18}{x^2-4x+3}\right) = \log_8 \frac{(x+6)(x-3)}{(x-3)(x-1)}$$

$$\log_8(x+6) + \log_8(x-3) - \log_8(x-3) - \log_8(x-1)$$

$$\log_8(x+6) - \log_8(x-1)$$

$$\log_8\left(\frac{x+6}{x-1}\right) = 2$$

logarithmic form

$$8^2 = \frac{x+6}{x-1}$$

$$64 = \left(\frac{x+6}{x-1}\right)(x-1)$$

$$64(x-1) = x+6$$

$$64x - 64 = x + 6$$

$$-x \qquad -x$$

$$63x - 64 = 6$$

$$+64 \quad +64$$

$$\frac{63x}{63} = \frac{70}{63}$$

$$x = \frac{70 \div 7}{63 \div 7} = \boxed{\frac{10}{9}}$$

$x - 1 \neq 0$

$+1 \quad +1$

$\boxed{x \neq 1}$

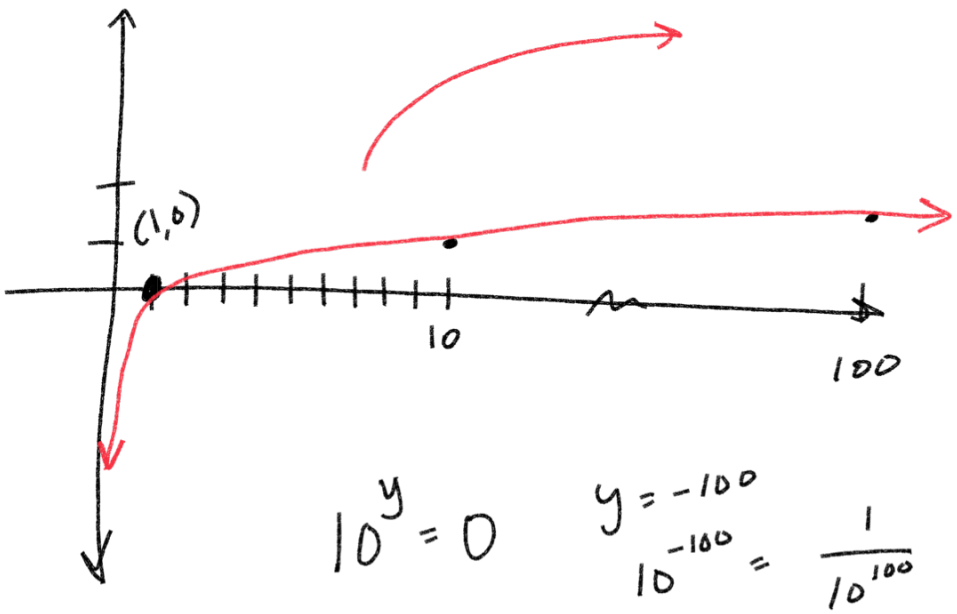
$y = \log x$

$y = \log_{10} x$

$10^y = x$

$x = 1 \qquad 10^y = 10$

$10^y = 1 \qquad 10^2$

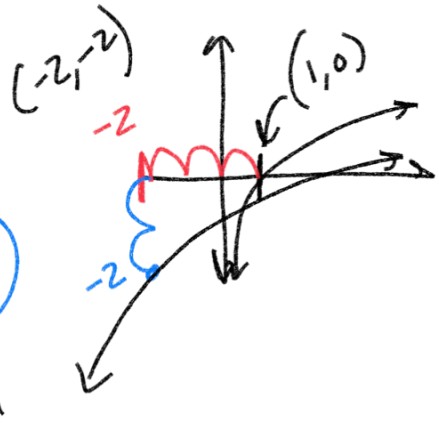


$10^y = 0$ $\qquad y = -100$

$10^{-100} = \frac{1}{10^{100}}$

log x

log (x+3) − 2



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