Solving Log Equations

$\log_{10} 10^7 = 7 \quad \ln e^{43} = 43 \quad 6^{\log_6 11} = 11$

Solve. $\log_5 x = 4$

Exponentiate! $5^{\log_5 x} = 5^4$

$x = 5^4$

$x = 625$

$\log_a 64 = 2$

$a^{\log_a 64} = a^2$

$\sqrt{64} = \sqrt{a^2}$

$\pm 8 = a$

must be + $\log_b x = y$ ← can be −

$b > 0, \; b \neq 1$

$x > 0$

$\log_{25} \sqrt[4]{5} = x$

$25^{\log_{25} \sqrt[4]{5}} = 25^x$

make common bases → $\sqrt[4]{5^1} = 25^x$

$5^{1/4} = 5^{2x}$

$\frac{1}{4} = 2x$

$\frac{1}{2} \cdot \frac{1}{4} = \frac{1}{2} \cdot 2x$

$\frac{1}{8} = x$

$\frac{1}{4} \cdot \frac{1}{2} = x$

$\frac{1}{8} = x$

PROPERTIES OF LOGS

$\log_b m + \log_b n = \log_b (m \cdot n)$

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

$\log_b m^p = p \cdot \log_b m$

$\log_2 2^5 = 5 \log_2 2^1$

$5 = 5 \cdot 1$

$\log_2 4 + \log_2 8 = \log_2 32$

$\log_2 2^2 + \log_2 2^3 = \log_2 2^5$

$2 + 3 = 5$

To Solve log. eq.

1) Use properties to change each side to one log.
2) Exponentiate & Solve.

$\log_7(x+5) + \log_7(x-3) = 2\log_7 3$

$\log_7((x+5)(x-3)) = \log_7 3^2$

$\log_7(x^2+2x-15) = \log_7 9$

$x^2+2x-15 = 9$

$-9 \quad -9$

$x^2+2x-24 = 0$

$(x+6)(x-4) = 0$

$x+6=0 \quad x-4=0$

extraneous solution → $x=-6$ ~~$x=-6$~~ $\quad \boxed{x=4}$ ← check for t values in orig. eq

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

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

$\ln_e(2x) = \ln_e 64$

$e^{\ln_e(2x)} = e^{\ln_e 64}$

$2x = 64$

$\boxed{x = 32}$ ← Check for + value

$\log x + \log(x+3) = 1$

$\log_{10}(x^2+3x) = 1$

$10^{\log_{10}(x^2+3x)} = 10^1$

$x^2 + 3x = 10^1$

$x^2 + 3x - 10 = 0$

$(x+5)(x-2) = 0$

$x+5=0 \quad x-2=0$

$x=-5 \quad x=2$

Check

$\log(1-x)$

$8^x = 117$

$\log 8^x = \log 117$

$\frac{x \cdot \log(8)}{\log(8)} = \frac{\log(117)}{\log(8)}$

$x \approx 2.29$

1) Take log of both sides & plog.

$\frac{7 \cdot e^{3x+5}}{7} = \frac{14}{7}$

$e^{3x+5} = 2$

$\ln(e^{3x+5}) = \ln 2$

$3x + 5 = \ln(2)$

$\frac{3x}{3} = \frac{\ln(2) - 5}{3}$

$x = -1.44$