

Recall the Rules of Exponents.

(1) $a^0 = 1$ (when $a \neq 0$)

(5) $(a \cdot b)^n = a^n \cdot b^n$

(2) $a^m \cdot a^n = a^{m+n}$

(6) $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ (when $b \neq 0$)

(3) $\frac{a^m}{a^n} = a^{m-n}$ (when $a \neq 0$)

(7) $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$ (when $a, b \neq 0$)

(4) $(a^m)^n = a^{m \cdot n}$

Recall the Rules of Logarithms.

(1) $\log_a x = y \iff a^y = x$

(5) $\log_a M^r = r \log_a M$

(2) $a^{\log_a M} = M$

(6) $\log_a(M \cdot N) = \log_a M + \log_a N$

(3) $\log_a a = 1$

(7) $\log_a\left(\frac{M}{N}\right) = \log_a M - \log_a N$

(4) $\log_a 1 = 0$

(8) $\log_a M = \frac{\log_b M}{\log_b a}$ (Change of Base)

1. Solve for x . (Remember that you cannot put a negative or zero into a log, so check that your solutions are valid.)

(a) $\log_{10}(x + 5) = 2$
 $x = 95$

(b) $\log_2(\log_2 x) = 1$
 $x = 4$

(c) $\ln(\ln x) = 0$
 $x = e$

(d) $\log_2(\log_4 x) = -1$
 $x = 2$

(e) $\log_6(x^2 - 5x) = 1$
 $x = \{-1, 6\}$

(f) $\log_2 x + \log_2(x + 1) = 1$
 $x = 1$

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

(h) $\ln(x - 4) + \ln(x + 1) = \ln 6$
 $x = 5$

2. Solve for x .

(a) $2^x = 32$

$x = 5$

(b) $3^x = 3^{1-2x}$

$x = \frac{1}{3}$

(c) $3^x = 9^{1-2x}$

$x = \frac{2}{5}$

(d) $a^{2x} = a^8$

$x = 4$

(e) $e^{(x+2)(x-3)} = 1$

$x = \{-2, 3\}$

(f) $2^{x-1} = 5$

$x = \frac{\ln 5}{\ln 2} + 1$

(g) $e^{3x+1} = 6$

$x = \frac{\ln 6 - 1}{3}$

(h) $7^{2x} = 3^{x+1}$

$x = \frac{\ln 3}{2 \ln 7 - \ln 3}$