Logarithmic Equations

TYPE 1: LOG = LOG

Notes/Examples

1. **CONDENSE** each logarithm.
2. **Use the One-to-One Property:** If $\log_b m = \log_b n$, then
3. **SOLVE** and **CHECK FOR EXTRANEOUS SOLUTIONS.**

$\log_5(5x+9) = \log_5(6x)$

$5x+9 = 6x$

$x = 9$

$\log_5(54) = \log_5(54)$ ✓

$\log_2(1-4n) = \log_2(2n+43)$

$1-4n = 2n+43$

$1-6n = 43$

$-6n = 42$

$n = -7$

$\log_9(6-3w) = \log_9(-2w)$

$6-3w = -2w$

$6 = w$

$6-3(6) = -12$

$\log_9(-12)$

LOGS CAN'T BE NEGATIVE

NO SOLUTION

$\frac{1}{2}\cdot\log_6 25 = \log_6(23-4w)$

$\log_6 25^{\frac{1}{2}} = \log_6(23-4w)$

$\log_6 5 = \log_6(23-4w)$

$5 = 23-4w$

$-18 = -4w$

$\frac{18}{4} = w$

$\frac{9}{2} = w$

TYPE 2: LOG = NUMBER

1. **CONDENSE** and **ISOLATE** the logarithm.
2. Write the equation in **EXPONENTIAL FORM.**
3. **SOLVE** and **CHECK FOR EXTRANEOUS SOLUTIONS.**

$\log_2(x-4) = 6$

$2^6 = x-4$

$64 = x-4$

$x = 68$ ✓

$\log_3(4x+8) - 7 = -3$

$+7 \quad +7$

$\log_3(4x+8) = 4$

$3^4 = 4x+8$

$81 = 4x+8$

$73 = 4x$

$\frac{73}{4} = x$ ✓

$\log_6(x+9) + \log_6 x = 2$

$\log_6(x(x+9)) = 2$

$\log_6(x^2+9x) = 2$

$6^2 = x^2+9x$

36

$x^2+9x-36 = 0$

$(x+12)(x-3) = 0$

$x = -12 \quad x = 3$ ✓

$2\cdot\log x - \log 4 = 2$

$\log\frac{x^2}{4} = 2$

$10^2 = \frac{x^2}{4}$

$4\cdot 100 = \frac{x^2}{4}\cdot 4$

$400 = x^2$

$x = \pm 20$

$x = 20$