

Solving Exponential and Log Equations

Step 1a: Isolate the exponential/log

Step 1b: Simplify using exponential/log properties

Step 2: Convert between exponential/log equation

Step 3: Solve the equation

Solve.

$$\log_4(6x) - 3 = -1$$

$$\log_4 6x = 2$$

Isolate the logarithm

$$6x = 4^2$$

Convert from log to exponential equation

$$6x = 16$$

Simplify and solve for x.

$$x = 2.\bar{6}$$

Solve.

$$3^{2x} - 8 = 2$$

$$3^{2x} = 10$$

Isolate the exponential

$$2x = \log_3 10$$

Convert from exponential to log

$$x = \frac{1}{2} \log_3 10$$

Solve for x

$$x = 1.048$$

Solve.

$$\log_2(x^2) + 5 = 4$$

$$\log_2 x^2 = -1$$

$$x^2 = 2^{-1}$$

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

$$x = \sqrt{1/2} = 0.707$$

Alternate way

$$\log_2 x^2 = -1$$

$$2 \log_2 x = -1$$

$$\log_2 x = \frac{-1}{2}$$

$$x = 2^{-1/2} = 0.707$$

Solve.

$$\log_4 2x + \log_4 3 = 2$$

$$\log_4 6x = 2$$

Condense into one log

$$6x = 4^2$$

Convert from log to exponential

$$6x = 16$$

Simplify and solve for x

$$x = 2.\bar{6}$$

Solve.

$$2e^{x-1} = \frac{12}{e^3}$$

$$2e^{x-1} \cdot e^3 = 12$$

Bring all exponentials to one side

$$2e^{x+2} = 12$$

Simplify with exponent properties

$$e^{x+2} = 6$$

Isolate the exponential

$$x + 2 = \ln 6$$

Convert from exponential to log

$$x = \ln(6) - 2$$

Solve for x.

$$x = -0.208$$

Solve for x.

$$b^{3x} + a = w$$

$$b^{3x} = w - a$$

Isolate the exponential

$$3x = \log_b(w - a)$$

Convert from exponential to log

$$x = \frac{1}{3} \log_b(w - a)$$

Solve for x.

Solve. $\log_2(x + 2) = 3 - \log_2 x$

$\log_2(x + 2) + \log_2(x) = 3$ *Bring all logs to one side*

$\log_2(x^2 + 2x) = 3$ *Condense using log properties*

$x^2 + 2x = 2^3$ *Convert from log to exponential*

$x^2 + 2x = 8$ *Simplify and solve for x*

$x^2 + 2x - 8 = 0$

$(x + 4)(x - 2) = 0$

$x + 4 = 0$ and $x - 2 = 0$

$x = -4$ and $x = 2$

$x = -4$ is extraneous because you cannot take the log of zero or a negative number.