

Solving

$$1. \ln(x+2) = 2$$
$$e^2 = x+2$$
$$\begin{array}{r} 2 \\ \rightarrow \\ -2 \end{array} \quad \begin{array}{r} \\ -2 \end{array}$$

$$e^2 - 2 = x$$

$$x = 5.39$$

$$2. \log_4(2x-1) = 2$$
$$4^2 = 2x-1$$

$$16 = 2x-1$$

$$\begin{array}{r} +1 \\ +1 \end{array}$$

$$\frac{17}{2} = \frac{2x}{2}$$

$$\boxed{x = \frac{17}{2}}$$

$$3. \log_x 9 = 2$$

$$x^2 = 9$$

$$\boxed{x=3} \text{ or } \cancel{x=-3}$$

No Neg # inside

log!

$$4. \log_4(10-x) = 2$$

$$4^2 = 10-x$$

$$16 = 10-x$$

$$6 = -x$$

$$\boxed{-6 = x}$$

# Rules for Logarithms

① Power Rule =  $\log_a m^x = x \log_a m$

Expand:  $\log C^4 = 4 \log C$

Condense:  $7 \ln X = \ln X^7$

② Product Rule =  $\log_a (mn) = \log_a (m) + \log_a (n)$

Expand ①  $\ln (4p) = \ln (4) + \ln (p)$

Condense ②  $\log_3 (5) + \log_3 (y) = \log_3 (5y)$

③ Quotient Rule  $\log_a \left(\frac{m}{n}\right) = \log_a (m) - \log_a (n)$

Expand  $\ln \left(\frac{5}{x}\right) = \ln 5 - \ln x$

Condense  $\log_7 3 - \log_7 y = \log_7 \left(\frac{3}{y}\right)$

Expand

$$\textcircled{1} \log_2 x(x-1) = \log_2 x + \log_2 (x-1)$$

$$\textcircled{2} \log_3 (x y^5) = \log_3 x + \log_3 y^5$$

$$\boxed{\log_3 x + 5 \log_3 y}$$

$$\textcircled{3} \ln \left( \frac{x^3 y^4}{z^6} \right) = \ln x^3 + \ln y^4 - \ln z^6$$

$$\boxed{3 \ln x + 4 \ln y - 6 \ln z}$$

Condense

$$\textcircled{1} \log_3 5 + 5 \log_3 2 = \log_3 5 + \log_3 2^5$$

$$\log_3 (5 \cdot 2^5)$$

$$\textcircled{2} \log_2 A + 2 \log_2 B - 4 \log_2 C$$

$$\log_2 A + \log_2 B^2 - \log_2 C^4$$

$$\log_2 \left( \frac{AB^2}{C^4} \right)$$

Solve

$$\textcircled{1} \log_3 X + \log_3 (X+6) = \log_3 16$$

$$\log_3 X(X+6) = \log_3 16$$

$$X(X+6) = 16$$

$$X^2 + 6X = 16$$

$$X^2 + 6X - 16 = 0$$

$$(X+8)(X-2) = 0$$

$$X+8=0 \quad X-2=0$$

$$\cancel{X=-8} \quad \boxed{X=2}$$

-8 makes The 1<sup>st</sup> log have a negative on the inside, so it is not valid.

Only answer is  $X=2$ .