Step 3: Power Rule and simplify:

$$x + 6 = \ln(4)$$

Step 4: Solve for x

$$\boxed{x = \ln(4) - 6}$$

Logarithmic Equations

Obj 3: Solve Logarithmic Equations by using the definition of Logarithm.

Recall:

quantity exponent

$$\log_{\boxed{b}} \boxed{M} = \boxed{c} \longrightarrow M = b^c$$

b

base

E.g. Solve:

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

Step 1: Rewrite to exponential form using definition of logarithm.

$$x + 3 = 4^2 = 16$$

Step 2: Solve for x.

$$x = 13.$$

E.g. Solve:

$$10 \cdot \log_2(x-4) + 17 = 47$$

Step 1: Isolate the logarithm.

$$10 \cdot \log_2(x-4) = 30$$

exponent

$$\log_{\boxed{2}}(x-4) = \boxed{3}$$

base

Step 2: Apply the definition of logarithm to rewrite:

$$x - 4 = 2^3 = 8$$

$$x = 12 \text{ (Solve for } x\text{)}$$

Obj 4: Solve logarithmic Equations using properties of logarithm.

E.g. Solve $\boxed{\log_2 x + \log_2(x-7)} = 3$

Step 1: Use properties of logarithm to obtain a single logarithm.

Product Rule:

$$\log_2 [x \cdot (x-7)] = 3$$

exponent

$$\log_{\boxed{2}} [x^2 - 7x] = \boxed{3}$$

base

Step 2: Rewrite to exponential form using definition of logarithm

$$x^2 - 7x = 2^3$$

$$x^2 - 7x = 8$$

Step 3: Solve for x.

$$x^2 - 7x - 8 = 0 \quad \text{(Subtract 8)}$$

$$(x-8)(x+1) = 0$$

$$x = 8 \;;\; x = -1.$$

Step 4: Check answers

Check : $\boxed{x = 8}$: $\log_2 8 + \log_2(8-7) \stackrel{?}{=} 3$

a solution

$3 + \log_2 1 \stackrel{?}{=} 3$

$3 + 0 \stackrel{?}{=} 3$ True

Check $\cancel{x = -1}$: $\cancel{\log_2(-1) + \log_2(-1-7)} \stackrel{?}{=} 3$

Not a solution

False

cannot have negative number in log