ex.1 Solve and verify the solution

$$\log_3 9x + \log_3 x = 4$$

$9x > 0$, $x > 0$; $x > 0$

product law

Remember when x is defined $x > 0$

$$\log_3(9x^2) = 4 \longleftrightarrow \log_3 3^4 \text{ (from 7.4)}$$

$$\log_3(9x^2) = \log_3 3^4$$

Since same $\log_3$ then values are equal

$$9x^2 = 3^4$$
$$9x^2 = 81$$
$$x^2 = 9$$
$$x = \pm 3$$

-3 is extraneous

$$x = 3$$

2. $\log 6x = \log(x+6) + \log(x-1)$

defined → $6x > 0$, $x > 0$; $x+6 > 0$, $x > -6$; $x-1 > 0$, $x > 1$

$x > 1$ (*)

$$\log 6x = \log(x+6)(x-1)$$
$$\log 6x = \log(x^2+5x-6)$$
$$6x = x^2+5x-6$$

FACTOR/FORMULA

$$6x = x^2 + 5x - 6$$
$$0 = x^2 - x - 6$$
$$0 = (x-3)(x+2)$$

FACTOR/FORMULA

$x = 3$ ~~$x = -2$~~

ex. 3 Using logs to solve exponential equations

a) $12 = 4^x$ change to $\log_4$

$\log_4 12 = \log_4 4^x$ ← (7.4!!)

$\log_4 12 = x$

$\frac{\log 12}{\log 4} = x$ use calc.

$1.79 = x$

b) $3^{x+1} = 6^x$

→ cannot use $\log_6$ since the left side has an exponent with variable

$\log 3^{(x+1)} = \log 6^{(x)}$

→ use common log.

$(x+1)\log 3 = x \log 6$

→ laws – power

→ dist. property

$x\log 3 + \log 3 = x \log 6$

→ gather like parts

$\log 3 = x\log 6 - x\log 3$ → factor out x

$x = \frac{\log 3}{\log 6 - \log 3}$ → quotient law OR eval.

$\log 3 = x(\log 6 - \log 3)$ → quotient law OR eval.

$\log 3 = x(\log 2)$

$\frac{\log 3}{\log 2} = x$ ← use calc.

$1.58 = x$

c) $\frac{36}{3} = \frac{3(2^{x+1})}{3}$ ← just like a ↑

$12 = 2^{x+1}$ → $\log_2$

$\log_2 12 = \log_2 2^{x+1}$

$\log_2 12 = x + 1$

$\log_2 12 - 1 = x$

$\frac{\log 12}{\log 2} - 1 = x$ use calc.

$2.58 = x$

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