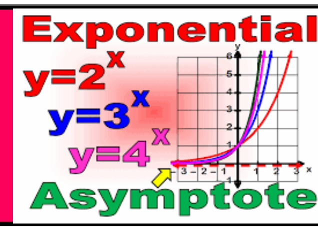
Unit 2

Exponents and Logarithms

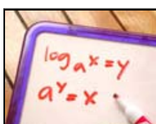


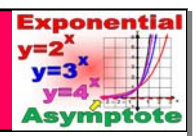
2.7 Solving Log Equations

- If everything has a log: Use log laws to simplify logs and then solve the arguments(the "inside" of the log).

- If a term/terms do not have a log: Simplify the logs to make a single log and rewrite as an exponent to solve.

*****Since you cannot take the log of a negative number, you MUST check for extraneous roots.*****





Ex.) Solve and verify.

a) logx - log2 = log5

$\log\left(\frac{x}{2}\right) = \log 5$

$\cancel{2} \cdot \frac{x}{\cancel{2}} = 5 \cdot 2$

$\boxed{x = 10}$

Verify

$\log 10 - \log 2 = \log 5$

$=$

b) $\log_5 \underline{3} + \log_5 \underline{x} = \log_5 30$

Verify

$\log_5(3x) = \log_5 30$

$3x = 30$

$\boxed{x = 10}$

c) $\log_5(x+1) + \log_5(x-3) = 1$

$\log_5[(x+1)(x-3)] = 1$

$5^1 = (x+1)(x-3)$

$5 = x^2 - 2x - 3$

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

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

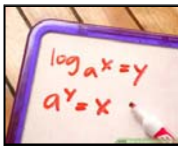
-8
-4 2
-2

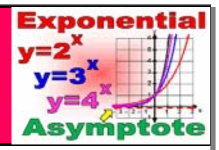
$x - 4 = 0$ $\quad x + 2 = 0$

$\boxed{x = 4}$ $\quad \cancel{x = -2}$

extraneous root

a)
b) -2, 4
c)
d) 4





d) log(8x+4) = 1 + log(x+1)

$\log(8x+4) - \log(x+1) = 1$

$\log_{10}\left(\frac{8x+4}{x+1}\right) = 1$

$10^1 = \frac{(8x+4)}{(x+1)}$

$10(x+1) = 8x+4$

$10x+10 = 8x+4$

$2x = -6$

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

extraneous root / ∴ no sol'n

e) $\log_2(x+3)^2 = 4$

$\cancel{\frac{2\log_2(x+3)}{2} = \frac{4}{2}}$

$\cancel{\log_2(x+3) = 2}$

$\cancel{2^2 = x+3}$

$\cancel{\boxed{x=1}}$

$2^4 = (x+3)^2$

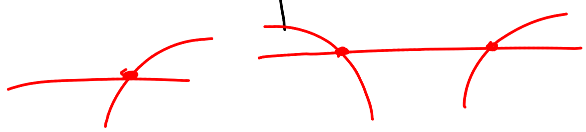
$16 = (x+3)(x+3)$

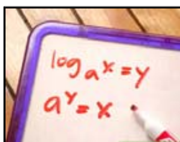
$16 = x^2+6x+9$

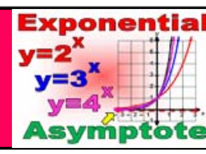
$0 = x^2+6x-7$

$0 = (x+7)(x-1)$

$\boxed{x=-7,\ 1}$







f) $\log_2(x-6) = 3 - \log_2(x-4)$

$\log_2(x-6) + \log_2(x-4) = 3$

$\log_2[(x-6)(x-4)] = 3$

$2^3 = x^2 - 10x + 24$

$0 = x^2 - 10x + 16$

$0 = (x-8)(x-2)$

$x = \cancel{2}, 8$

extraneous solution

g) $\log_7 x + \log_7(x-1) = \log_7 4x$

$\log_7[x(x-1)] = \log_7 4x$

$x^2 - x = 4x$

$x^2 - 5x = 0$

$x(x-5) = 0$

$x = \cancel{0}, 5$

extraneous root

Pg. 412 # 1, 5, 6, 8.