Algebra 2   7.4
Solve logarithmic equations $=$
Solve logarithmic inequalities $<$ $>$
domain
          $x>0$
extraneous (solution)
argument
whiteboards
base 10 log

$\log_{10}(100) = 2$

$10^2 = 100$

Quiz 7.3-7.4 Fri.

1B. $\log_{10} x = \frac{5}{2}$

$$16^{\frac{5}{2}} = x$$

$$1024 = x$$

Try writing in exp form

KeyConcept Property of Equality for Logarithmic Functions

Symbols	If b is a positive number other than 1, then $\log_b x = \log_b y$ if and only if $x = y$.
Example	If $\log_5 x = \log_5 8$, then $x = 8$. If $x = 8$, then $\log_5 x = \log_5 8$.

2 different types of problems: all logs same base (for now) b>1
                                                  only one log in the problem

11. $\log_6 \dfrac{1}{36} = x$

$$6^x = 6^{-2}$$

14. $\log_3 (3x + 8) = \log_3 (x^2 + x)$

$\overset{-6\ +8}{\underset{2}{}} \qquad \overset{4\ +-2}{\underset{2}{}}$

$$3x + 8 = x^2 + x$$

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

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

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

$$x = 4 \qquad x = 2$$

-8 $-4 \quad 2$ -2

check answers
(argument (antilog) must be pos.)

4 – 12

16. $\log_6 (x^2 - 6x) = \log_6 (-8)$

$x^2 - 6x = -8$

$x^2 - 6x + 8 = 0$

$(x-4)(x-2)$

$x = 4 \qquad x = 2$

NS

Example 3 Solve a Logarithmic Inequality

Solve $\log_3 \boxed{x} > 4$.

$$x > 3^4$$

$$x > 81$$

Argument must be positive
If = no problem.

My number vs 3^4

But if my exponent is bigger...

Solve each inequality.

3A. $\log_4 x \geq 3$

$$x \qquad 4^3$$

$$x \geq 64$$

3B. $\log_2 x \leq 4$

$x < 2^4$

$x < 16$

argument must be positive

$0 < x \leq 16$

$0 < x \leq 16$

0   16

$$2x + 1 > 0$$
$$\underline{\qquad\qquad}$$
$$\frac{-1 \quad -1}{2x > -1}$$

$$x + 4 > 0$$
$$\underline{\qquad\qquad}$$
$$-4 \quad -4$$

4. Solve $\log_5 (2x + 1) \le \log_5 (x + 4)$ Check your solution.

$$\boxed{x > -4}$$

$$2x + 1 \quad \le \quad x + 4$$
$$-x - 1 \qquad\quad -x - 1$$
$$\underline{\qquad\qquad\qquad\qquad}$$
$$x \quad \le \quad 3$$

$$x > -\frac{1}{2}$$

$-4 \qquad -\frac{1}{2} \qquad\qquad 3$

Solve each inequality.

4. $\log_5 x > 3$

6. $\log_4 (2x + 5) \leq \log_4 (4x - 3)$

7. $\log_8 (2x) > \log_8 (6x - 8)$

28. $\log_2 (4x - 6) > \log_2 (2x + 8)$

20.

speed ↓   dist. ↓

$w = 93 \log_{10} d + 65$

-65 -65

$\left(\dfrac{w-65}{93}\right) = \log_{10} d$

$10^{\frac{w-65}{93}} = d$

$w = 93 \log_{10} 525 + 65$ 2.72

$= 93(2.72) + 65$

318

$10^{\frac{w-65}{93}} = 525$

W.B.   2x   12yrs
        20x current

$y = (\ )^x$ ~~✗~~

$20y = (2)^{\frac{1}{12}x}$

$\frac{1}{12}x = \log_2 y$

$$\boxed{x = 12\log_2 \frac{20y}{2}}$$

(??)

$$\log_9\left(\boxed{2x-1}\right) < 0.5$$

$$2x-1 < 9^{0.5}$$

$$\textcolor{red}{2x-1 > 0}$$
$$\textcolor{red}{2x > 1}$$
$$\textcolor{red}{x > \frac{1}{2}}$$

$$2x-1 < 3$$
$$+1 \qquad +1$$
$$2x = 4$$
$$x < 2$$