√( ) √( )

Algebra 2 7.4

Solve logarithmic equations $x = 5$

Solve logarithmic inequalities $x < 2$

domain

x>0

extraneous (solution)

argument

whiteboards

$\log_{10}(\_\_)$

**1B.** $\log_{16} x = \frac{5}{2}$

$16^{2.5} = x$

$1024 = x$

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.** $\log_6 \frac{1}{36} = x$

$$6^x = \left(\frac{1}{6}\right)^2$$

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

$$x = -2$$

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

$(-6+8)$ $(4+-2)$

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

$-3x - 8 \quad -3x - 8$

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

$-8$, $-4$, $2$, $-2$

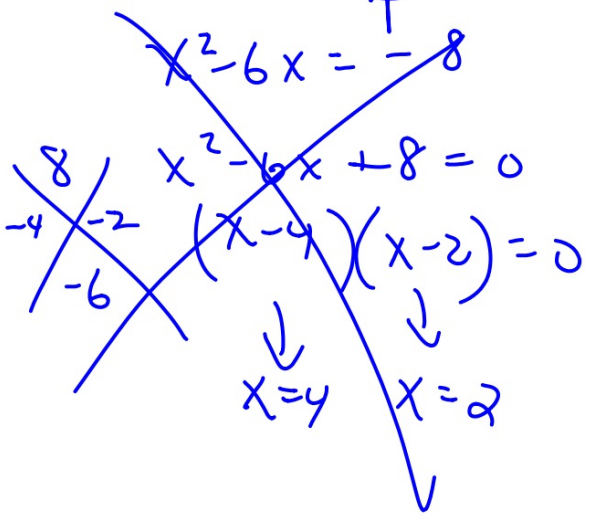
$0 = (x-4)(x+2)$

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

$x = 4 \quad x = -2$

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

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



$x < 3^4$ $x < 81$

## Example 3 Solve a Logarithmic Inequality

**Solve $\log_3 x < 4$.**

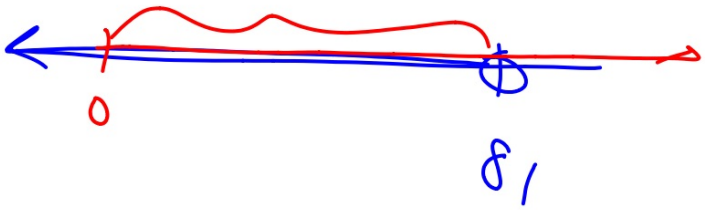
$x < 3^4$

$x > 0$

$x > 3^4$

$x > 81$

$0 < x < 81$




Argument must be positive
If = no problem.
My number vs $3^4$
But if my exponent is bigger...

**GuidedPractice**

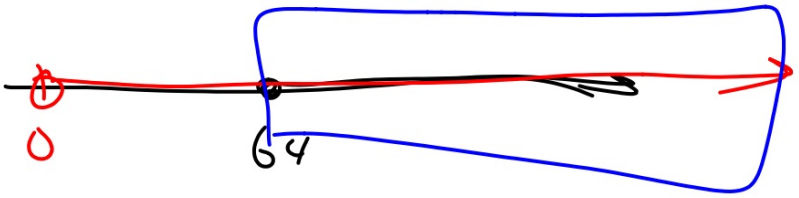
**Solve each inequality.**

**3A.** $\log_4 x \geq 3$

$x > 0$

$x \geq 4^3$

$x \geq 64$



**3B.** $\log_2 x < 4$

argument must be positive

**GuidedPractice**

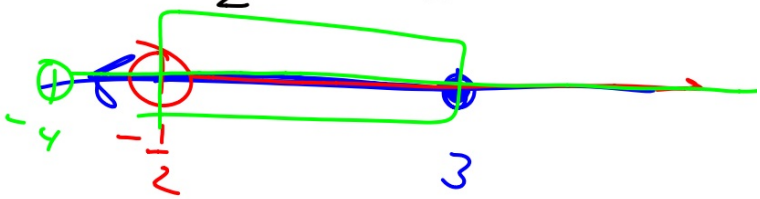
**4.** Solve $\log_5 (2x + 1) \leq \log_5 (x + 4)$. Check your solution.

$2x+1>0$, $x+4>0$

$2x+1 \leq x+4$

$x \leq 3$

$-\frac{1}{2} < x \leq 3$




$\log_{11}(x+7) < 1$

**Solve each inequality.**

**4.** $\log_5 x > 3$

$x > 5^3$

$x > 125$

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

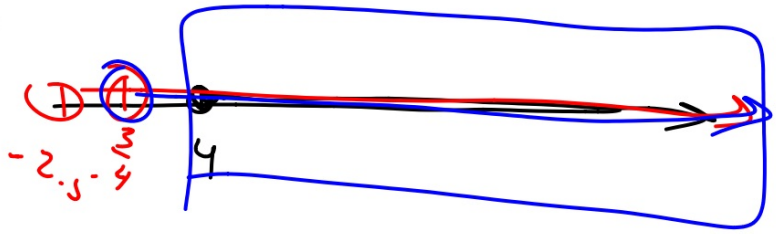
$2x+5 \leq 4x-3$

$-4x-5 \quad -4x-5$

$-2x \leq -8$

$\frac{-2x}{-2} \leq \frac{-8}{-2}$

$x \geq 4$




$2x+5>0$

$-5 \quad -5$

$\frac{2x}{2} > \frac{-5}{2}$

$4x-3>0$

$4x>3$

$\frac{4x}{4} > \frac{3}{4}$

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

$2x > 6x - 8$

$-6x \quad -6x$

$-4x > -8$

$\frac{-4x}{-4} > \frac{-8}{-4}$

$x < 2$

$2x > 0$

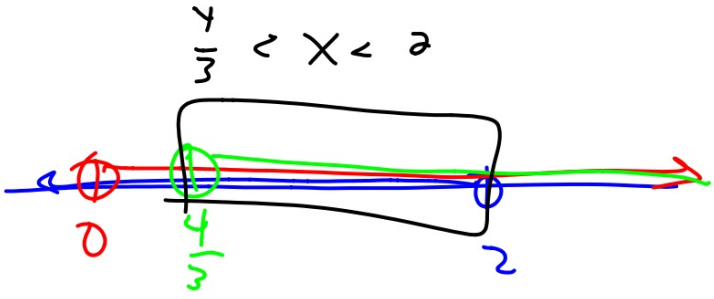
$\frac{2x}{2} > \frac{0}{2}$

$x > 0$

$6x - 8 > 0$

$\frac{6x}{6} > \frac{8}{6}$ $\quad x > \frac{4}{3}$

$\frac{4}{3} < x < 2$

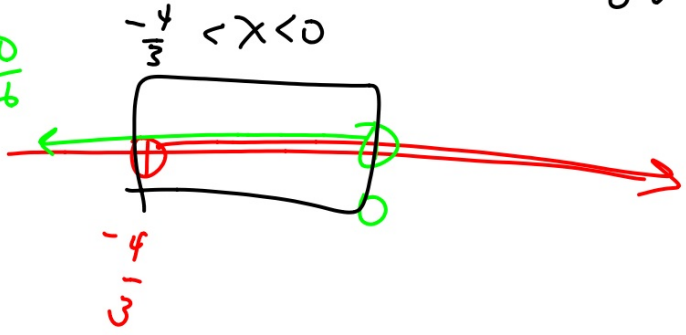


$\log_8(-6x) < 1$

$-6x > 0$

$\frac{-6x}{-6} < \frac{8}{-6}$ $\quad x < 0$

$x > -\frac{4}{3}$




WB 7.4 prac
odds

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