

## Solving Logarithmic Equations – Intermediate Algebra

- Steps:**
1. Isolate the logarithm(s) on one side of the equation.
  2. Combine logarithms into a single logarithm if necessary.
  - 3. Rewrite the logarithm in exponential form.
  4. Solve the equation by isolating the variable.

Examples: Solve.

1.  $\log(x-10) = 3$

Isolate ✓

Combine ✓

Rewrite  $10^3 = x-10$

$$\begin{array}{r} 1000 = x-10 \\ +10 \quad +10 \\ \hline 1010 = x \end{array}$$

2.  $\log(x+4) = 2$

Isolate ✓

Combine ✓

Rewrite  $10^2 = x+4$

$$\begin{array}{r} 100 = x+4 \\ -4 \quad -4 \\ \hline 96 = x \end{array}$$

3.  $\log x = \log 5$

1<sup>st</sup> instinct

$$x = 5$$

1-1 property of logarithms

isolate  $\log x - \log 5 = 0$

combine  $\log \frac{x}{5} = 0$

rewrite  $10^0 = \frac{x}{5}$

solve  $5 \cdot 1 = \frac{x}{\cancel{5}}$

$$5 = x$$

$$4. \log(2x) + \log(3x) = 3$$

Isolate ✓

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

Simp  $\log(6x^2) = 3$

rewrite  $10^3 = 6x^2$

solve  $\frac{1000}{6} = \frac{6x^2}{6}$

$$\frac{1000}{6} = x^2$$

$$\pm \sqrt{\frac{1000}{6}} = x$$

$$\sqrt{\frac{1000}{6}} = x$$

$$x \approx 12.9099$$

$$x = 12.910$$

Domain says  
 $2x > 0$  and  $3x > 0$   
 $x > 0$

$$5. \log_3(3x+5) = 4$$

Isolate ✓

Combine ✓  
 rewrite  $3^4 = 3x+5$

Solve  $81 = 3x+5$

$$\begin{array}{r} 81 = 3x+5 \\ -5 \quad -5 \\ \hline \end{array}$$

$$\frac{76}{3} = \frac{3x}{3}$$

$$\frac{76}{3} = x$$

exact

$$25.333$$

Approx