

May 6

## Logarithms and Exponents

Rewrite: (move numbers around)

$$\begin{array}{ccc} \text{base} \rightarrow 6 & \xleftrightarrow{\quad} & \log_6 216 = 3 \\ \begin{array}{l} 3 \leftarrow \text{exponent} \\ \text{exponential} \\ \text{form} \end{array} & & \begin{array}{l} \text{base} \leftarrow 6 \\ \text{logarithmic} \\ \text{form} \end{array} \end{array}$$

Rewrite in exponential form:

(Ex1)  $\log_2 8 = 3$   
 $8 = 2^3$  or  $2^3 = 8$

(Ex2)  $2 = \log_7 49$   
 $7^2 = 49$

Rewrite in logarithmic form.

(Ex3)  $4^3 = 64$   
 $3 = \log_4 64$  or  $\log_4 64 = 3$

(Ex4)  $\frac{1}{2} = 2^{-1}$   
 $\log_2 \frac{1}{2} = -1$

Evaluate: (type into calculator)

(Ex5)  $\log_2 4 = 2$

(Ex7)  $\log_2 10 = 3.32$

(Ex6)  $\log_3 81 = 4$

(Ex8)  $\log_{10} 88 = 1.94$

\*If a log has no written base, it is an understood base 10.

# Solve Log Equations

● (Ex9) Solve:  $\log_3 x = 7$   
 $x = 3^7$   
 $x = 2187$

(Ex10) Solve:  $\log_4 (x+3) = 2$   
 $x+3 = 4^2$   
 $x+3 = 16$   
 $\begin{array}{r} x+3 = 16 \\ -3 \quad -3 \\ \hline x = 13 \end{array}$

● (Ex11) Solve:  $\log_{10} (3x-7) = 1$   
 $3x-7 = 10^1$   
 $3x-7 = 10$   
 $\begin{array}{r} 3x-7 = 10 \\ +7 \quad +7 \\ \hline 3x = 17 \\ \div 3 \quad \div 3 \\ \hline x = 5.67 \end{array}$

(Ex12) Solve:  $\log_x 25 = 2$   
 $\sqrt{25} = \sqrt{x^2}$   
 $5, \cancel{5} = x$   
 $5 = x$

\* bases cannot be negative.

Ex13) Solve:  $\log_x 11 = 3$

$$\sqrt[3]{11} = x^3$$

$$\boxed{2.22 = x}$$

Ex14) Solve:  $\log_x(8x+3) = \log_x(6x+15)$

equal  
↓  
\*Collision!\*

$$\begin{array}{r} 8x+3 = 6x+15 \\ -6x \quad -6x \\ \hline 2x+3 = 15 \\ -3 \quad -3 \\ \hline 2x = 12 \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline \boxed{x=6} \end{array}$$