

October 10

● Exponential and Logarithmic Form

exponential form: $3^2 = 9$
base \downarrow exponent

logarithmic form: $\log_3 9 = 2$ ← "exponent"
base \uparrow

(Ex) Rewrite in exponential form:

~~$\log_5 125 = 3$~~
swoosh!

$125 = 5^3$ same as $5^3 = 125$

~~$\log_9 6561 = 4$~~

$6561 = 9^4$

~~$5 = \log_2 32$~~

$2^5 = 32$

~~$\log_{10} 100 = 2$~~

$100 = 10^2$

*If your log has no written base, it is an understood base of 10.

Ex2 Rewrite in logarithmic form:

$$6^3 = 216$$

$$3 = \log_6 216 \quad \text{same as } \log_6 216 = 3$$

$$4^{-1} = \frac{1}{4}$$

$$-1 = \log_4 \frac{1}{4}$$

$$1000 = 10^3$$

$$\log_{10} 1000 = 3 \quad \text{or} \quad \log 1000 = 3$$

Solve Logarithmic Equations

Ex3 Solve: ~~log~~ $\log_7 X = 4$

$$X = 7^4$$

$$X = 2401$$

Ex4 Solve: ~~log~~ $\log_5(3x+1) = 2$

$$3x+1 = 5^2$$

$$3x + 1 = 25$$

$$\begin{array}{r} 3x + 1 = 25 \\ -1 \quad -1 \\ \hline \end{array}$$

$$3x = 24$$

$$\begin{array}{r} 3x = 24 \\ \div 3 \quad \div 3 \\ \hline \end{array}$$

$$x = 8$$

Ex5 Solve: $4 = \log_{10}(6x - 3)$

$$10^4 = 6x - 3$$

$$10000 = 6x - 3$$

$$\frac{10003}{6} = \frac{6x}{6}$$

$$\boxed{1667.17 = x}$$

Ex6 Solve: $\log_8(3x - 1) = \log_8(2x + 4)$

Property: If $\log_b M = \log_b N$, then $M = N$

Translation: If two logs with the same base are equal, then what is inside the logs are equal to each other.

$$\begin{array}{r} 3x - 1 = 2x + 4 \\ - 1 + 1 \\ \hline 3x = 2x + 5 \\ -2x -2x \\ \hline \boxed{x = 5} \end{array}$$