Section 12.2 Logarithmic Functions

Exponential Form:

$2^4 = 16$

INPUT = exponent

OUTPUT

$\log_2 16 = 4$

what do you raise 2 to to get 16?

EXPONENT

$2^4 = 16$

BASE

ANSWER

LOGARITHMIC

$\log_3 9 = 2$

what do you raise 3 to to get 9?

EXPONENTIAL

$3^2 = 9$

"log roll"

$\log_3 9 = 2$

$3^2 = 9$

LOGARITHMIC → EXPONENTIAL

$\log_5 125 = 3$ → $5^3 = 125$

$\log_3 \frac{1}{27} = -3$ $\quad 3^{-3} = \frac{1}{27}$

EXPONENTIAL → LOGARITHMIC

$8^2 = 64$ → $\log_8 64 = 2$

$10^{-3} = \frac{1}{1000}$ → $\log_{10} \frac{1}{1000} = -3$

$\sqrt{b} = b^{1/2}$

Evaluate:

$\log_5 625 = x$

$5^x = 625$

$5^x = 5^4$

$x = 4$

$\log_7 \sqrt{7} = x$

$7^x = \sqrt{7}$

$7^x = 7^{\frac{1}{2}}$

$x = \frac{1}{2}$

$\log_{27} 3 = x$

$27^x = 3$

$27 = 3^3$

$27^x = (3^3)^x$

3^{3x}

$3^{3x} = 3^1$

$3x = 1$

$x = \frac{1}{3}$

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

$b^{-m} = \frac{1}{b^m}$

$6^x = \frac{1}{36}$

$6^x = \frac{1}{6^2}$

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

$x = -2$

PROPERTIES:

$\log_a 1 = 0$

$\log_a a = 1$

$\log_a a^x = x$

$a^{\log_a x} = x$