

10-2 Logarithms and Log Functions Day 1

Logarithm = Exponent

Objective: Evaluate logarithmic expressions.
Solve logarithmic equations and inequalities.

I. **Intro-** Read P.531 Why is a logarithmic scale used?

II. **Logarithm:** In general, the inverse of $y=b^x$ is $x=b^y$ (reflections across line $y=x$). In $x=b^y$, y is called the logarithm of x and written as $y=\log_b x$ (read y equals the log of base b of x).

III. **Log to exponential form.**

$$y = \log_b X \Rightarrow b^y = X$$

Annotations: In the first equation, 'y' is labeled 'exponent' and 'b' is labeled 'base'. In the second equation, 'y' is labeled 'exponent' and 'b' is labeled 'base'.

EX 1. $\log_3 9 = 2$

$$3^2 = 9$$

EX 2. $\log_{10}(1/100) = -2$

$$10^{-2} = \frac{1}{100}$$

EX 3. $\log_2(1/16) = -4$

$$2^{-4} = \frac{1}{16}$$

IV. **Exponential to log form.**

EX 4. $5^3=125$

$$\log_5 125 = 3$$

EX 5. $27^{1/3}=3$

$$\log_{27} 3 = \frac{1}{3}$$

V. **Evaluate logs.**

EX 6. $\log_3 243 = y$

$$3^y = 243 \quad 3^y = 3^5 \quad \boxed{y=5}$$

EX 7. $\log_2 64 = y$

$$2^y = 64 \quad 2^y = 2^6 \quad \boxed{y=6}$$

VI. **Characteristics of logs.**

1. continuous and one to one
2. D: all positive real numbers
3. y-axis is an asymptote
4. R: all real numbers
5. Graph contains the point (1,0) (x-intercept)

