Key

7.3 - Logarithms Day 1 Notes

Fill in the table of values and graph $y = 2^x$ on the grid. Then, using what you know about the graphs of inverse functions & a different color pencil/pen, graph the inverse.

Function: $2^x = y$	
x	y
−2	1/4
−1	1/2
0	1
1	2
2	4
3	8

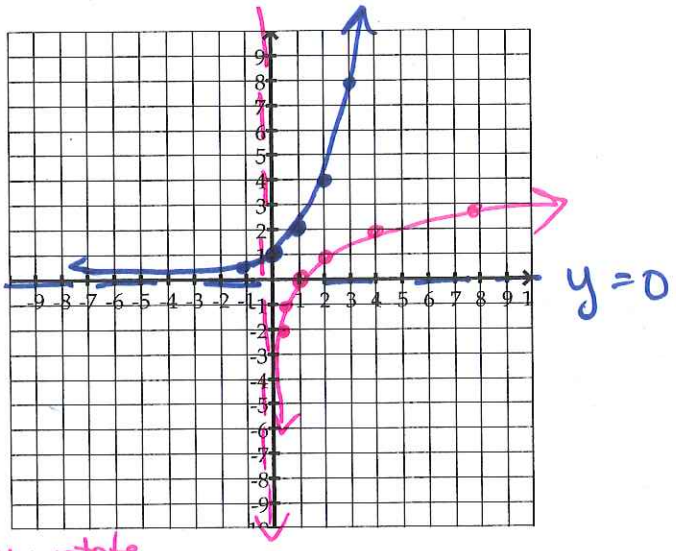
horizontal asymptote

Inverse: $f^{-1}(x)$

$2^y = x$

x	y
1/4	−2
1/2	−1
1	0
2	1
4	2
8	3

vertical asymptote



The inputs for $f(x)$ are the exponents.

The outputs for $f^{-1}(x)$ are the exponents

- The inverse of an exponential equation is called a logarithm. *
- The 'answer' to a logarithm is always the exponent.
- Logarithm simply means, "What exponent goes on..."

What exponent goes on 2 to make 8? 3

What exponent goes on 2 to make $\frac{1}{2}$? −1

What exponent goes on 2 to make 1? 0

What exponent goes on 2 to make 2? 1

What Exponent Goes On

1. $WEGO_2(8) =$ 3 — $2^3 = 8$
2. $WEGO_2\left(\frac{1}{32}\right) =$ −5 — $(2)^{-5} = \frac{1}{2^5} = \frac{1}{32}$
3. $WEGO_7(1) =$ 0 — $7^0 = 1$
4. $WEGO_3(9) =$ 2 — $3^2 = 9$
5. $WEGO_3\left(\frac{1}{81}\right) =$ −4 — $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$
6. $WEGO_4(64) =$ 3 — $4^3 = 64$

Translating into Logarithms

$WEGO_2(8) =$ 3 $\rightarrow \log_2(8) =$ 3

another way to write "what exponent goes on..."

$WEGO_2\left(\frac{1}{32}\right) =$ -5 $\rightarrow \log_2\left(\frac{1}{32}\right) =$ -5

Remember!! the answer to
A logarithm is the **exponent** to which a specific base is raised to obtain a given value.
You can write exponential equations as a logarithm, and vice versa.

translating from exponential to log form

* what exponent goes on "b" to give me a?

$b^x = a$

$\log_b a = x$

$\log_b a = x$

translating from log to exponential form

base, exponent

$b^x = a$

* $b > 0, \quad b \neq 1$

Write each exponential equation in logarithmic form.

ex. $3^5 = 243$

$\log_3 243 = 5$

1. $7^2 = 49$

$\log_7 49 = 2$

2. $10^4 = 10{,}000$

$\log_{10} 10{,}000 = 4$

ex. $6^{-1} = \frac{1}{6}$

$\log_6\left(\frac{1}{6}\right) = -1$

3. $3^{-2} = \frac{1}{9}$

$\log_3\left(\frac{1}{9}\right) = -2$

4. $4^{\frac{1}{2}} = 2$

$\log_4 2 = \frac{1}{2}$

Write each logarithmic expression in exponential form.

ex. $\log_2(8) = 3$

base, exponent

$2^3 = 8$

5. $\log_4(16) = 2$

$4^2 = 16$

6. $\log_3(81) = 4$

$3^4 = 81$

ex. $\log_4\left(\frac{1}{256}\right) = -4$

$4^{-4} = \frac{1}{256}$

7. $\log_{\frac{1}{5}}(3125) = -5$

$\left(\frac{1}{5}\right)^{-5} = 3125$

8. $\log_9(9) = 1$

$9^1 = 9$