Quiz 7.1-7.2 Tues.

Algebra 2 7.3 log (exponent)

Evaluate logarithmic expressions

Graph logarithmic functions

inverse function

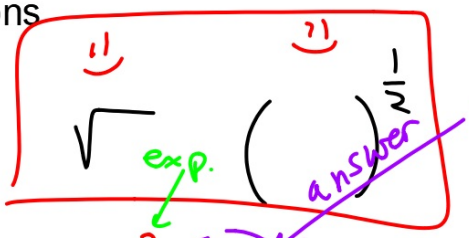
x + 2	+ −
2x	× ÷
x^2	$(\,)^2$ $\sqrt{\ }$
2^x	$(\,)^x$ log

base

exponent

logarithm $y = 3^x$

$9 = 3^2$



$10^2 = 100$

base

$\log_3 9 = 2$

$\log_{10} 100 = 2$

base

exp

$7^{1/3}$ or $\sqrt[3]{7}$

b^{-2} or $1/b^2$

Do they mean the same thing?

Why do we need both?

exp $\longleftrightarrow$ log

Logarithm (log) is inverse of exponential
Base Log=exp (number is called antilog)

KeyConcept Logarithm with Base *b*

Words Let b and x be positive numbers, $b \neq 1$. The *logarithm of x with base b* is denoted $\log_b x$ and is defined as the exponent y that makes the equation $b^y = x$ true.

Symbols

Example If $\log_3 27 = y$, then $3^y = 27$.

base ^{exp}=number
$\log_{base}$number=exponent

Where is the base in each expression?
Where is the exponent?
Where is the number/answer/antilogarithm?

Example 1 Logarithmic to Exponential Form

Write each equation in exponential form.

a. $\log_2 8 = 3$

b. $\log_4 \frac{1}{256} = -4$

$2^3 = 8$

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

1. What is the base?
2. exponent?
3. number? (antilog)
4. re-format

GuidedPractice

1A. $\log_4 16 = 2$

$4^2 = 16$

1B. $\log_3 729 = 6$

$3^6 = 729$

Example 2 Exponential to Logarithmic Form

Write each equation in logarithmic form.

a. $15^3 = 3375$

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

$\log_{15} 3375 = 3$

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

write in log form

GuidedPractice

2A. $4^3 = 64$

2B. $125^{\frac{1}{3}} = 5$

$\log_4 64 = 3$

Example 3 Evaluate Logarithmic Expressions

Evaluate $\log_{16} 4 = ?$

$16^{?} = 4$

$16^{x} = 4$

$(4^2)^{x} = 4^{1}$

$2x = 1$

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

remember log=exponent

What exponent is needed?

what is the exponent needed?

Evaluate each expression.

3A. $\log_3 81 = 4$

$3^? = 81$

$3^x = 81$

$3^x = 3^4$ $x = 4$

3B. $\log_{\frac{1}{2}} 256 = -8$

$\frac{1}{2}^x = 256$

$(2^{-1})^x = 2^8$

$-x = 8$ $x = -8$

$\log_3$

$\log_4 \frac{1}{64} = ?$

$4^x = \frac{1}{64}$

$4^x = 4^{-3}$

Remember: log is just inverse of exp function!

Line of symmetry y=x

$y = 2^x$

x	y
0	1
1	2
2	4
-1	$\frac{1}{2}$

$y=\log_2 x$

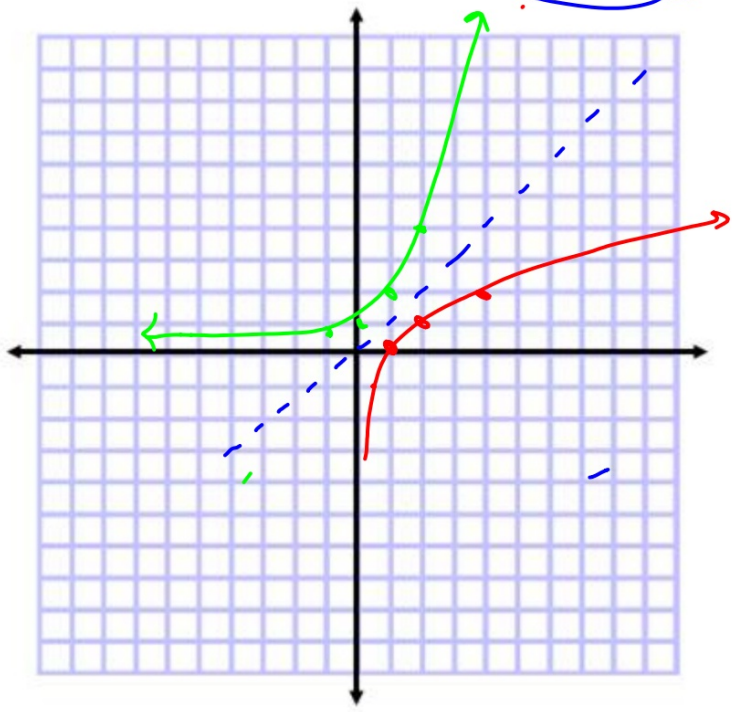
x	y
1	0
2	1
4	2
$\frac{1}{2}$	-1

$x = 2^y$

$y = x^2$

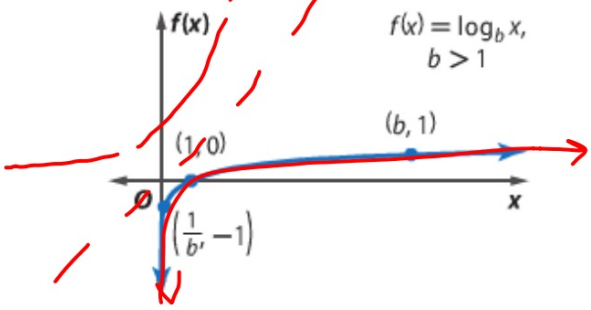
$\sqrt{x} = \sqrt{y}^2$

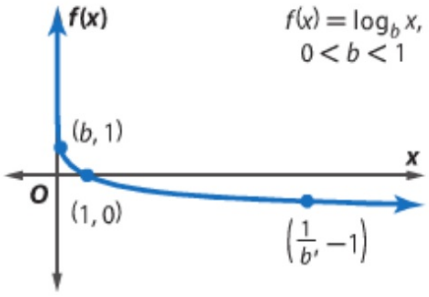
$\pm\sqrt{x} = y$



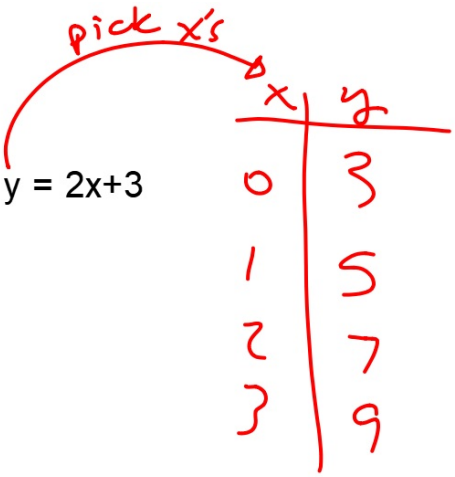
KeyConcept Parent Function of Logarithmic Functions

Parent function:	$f(x) = \log_b x$	**Type of graph:**	continuous, one-to-one
Domain:	all positive real numbers	**Range:**	all real numbers
Asymptote:	$f(x)$-axis	**Intercept:**	(1, 0)





What is the procedure when we graph y = 2x+3
(Using table of values)



Hint: Solved for y so we choose...

Usually easier to graph if re-write in exp form

Example 4 Graph Logarithmic Functions

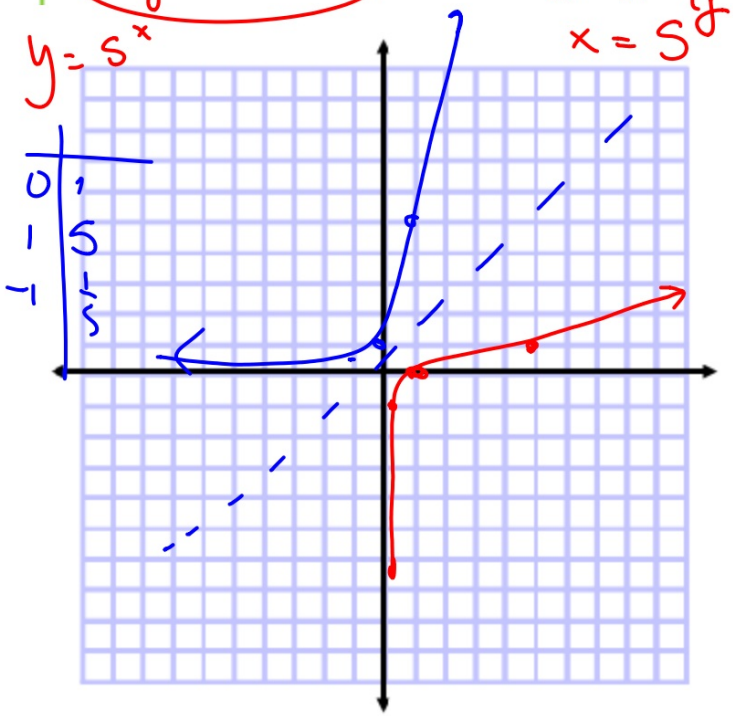
Graph ~~each~~ function.

a. $y = \log_5 x$

$5^y = x$

$x = 5^y$

$y = 5^x$



Which parent graph?
(try writing in exp form)
Determine points
(Solved for x so we choose y's)
Plot graph

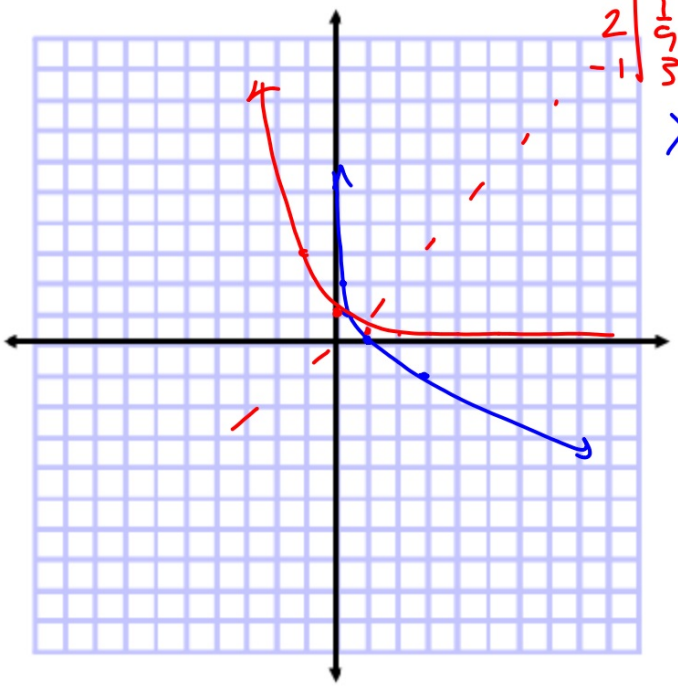
x	y
1	0
5	1
$\frac{1}{5}$	-1

b. $y = \log_{\frac{1}{3}} x$

$\left(\frac{1}{3}\right)^y = x \qquad y = \left(\frac{1}{3}\right)^x$

-1	3
0	1
2	$\frac{1}{9}$
-1	3

Which parent graph?
(try writing in exp form)
Determine points
(Solved for x so we choose y's)
Plot graph



$X = \left(\frac{1}{3}\right)^y$

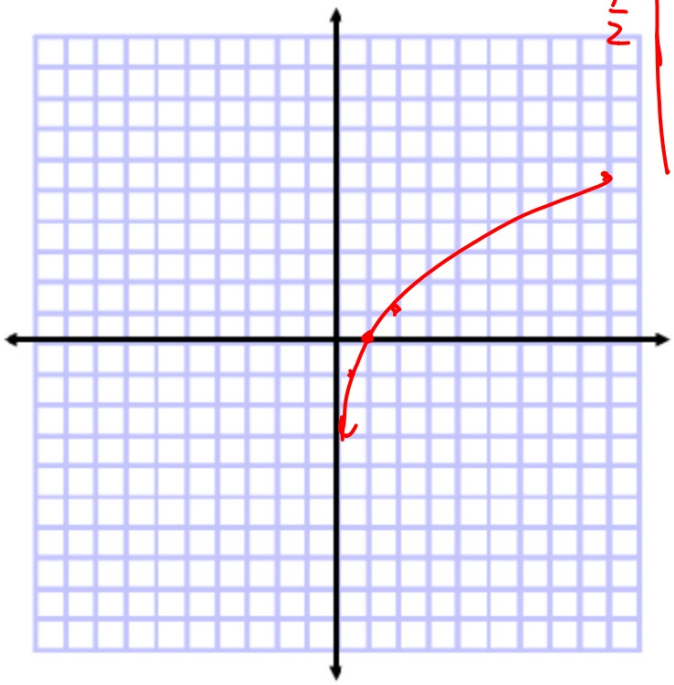
x	y
$\frac{1}{3}$	1
1	0
$\frac{1}{9}$	2
3	-1

GuidedPractice

4A. $f(x) = \log_2 x$

$x = 2^y$

x	y
2	1
1	0
$\frac{1}{2}$	-1



13-4 Log and Exp Functions

Which parent graph?
(try writing in exp form)
Determine points
(Solved for x so we choose y's)
Plot graph

4B. $f(x) = \log_{\frac{1}{8}} x$