Today's Plan:

Learning Target (standard): I will graph exponential functions using transformations. I will graph logarithmic functions.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Go over your graphs with someone near you. Please do not hesitate to ask any questions you may have!

Inverses & Exponentials Worksheet

1) The inverse is not a function. The x-value of $200 has more than one y-values, namely 20 and 25 hours.

2) Graph (switch x & y)

3) use the composites to verify that f(g(x)) & g(f(x)) both are x.

4) $f(x)=\frac{2x-3}{x+4};D:\{x\,|\,x\neq -4\}\ \&\ R:\{y\,|\,y\neq 2\}$

$f^{-1}(x)=\frac{-4x-3}{x-2};D:\{x\,|\,x\neq 2\}\ \&\ R:\{y\,|\,y\neq -4\}$

verify with composites

Logarithmic Functions:

A logarithmic function is a function where *a* > *0* and a ≠ 1 and is denoted by

$$y=\log_a x \qquad \text{if and only if} \qquad x=a^y$$

$$f(x)=3^x$$

$$f^{-1}(x)=\log_3 x$$

Special Logarithms:

1) natural logarithm

$y = \log_e x$

$y = \ln x$

2) common logarithm

$y = \log_{10} x$

$y = \log x$

Graph the function and its inverse function. Find the domain and range of each. Find the inverse function.

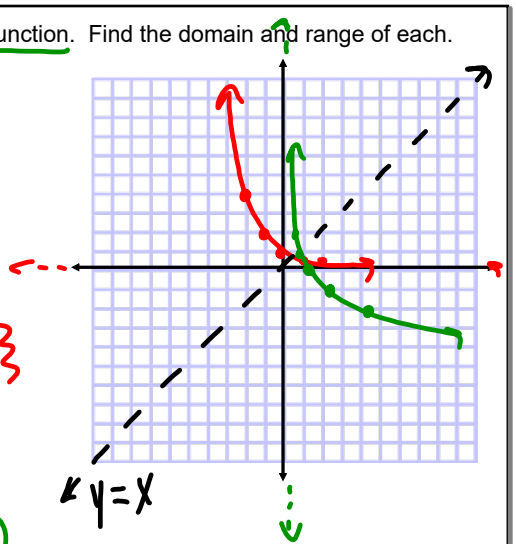
$$f(x) = \left(\frac{1}{2}\right)^x$$

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

HA: $y=0$

D: $\mathbb{R}$

R: $\{y \mid y>0\}$



$f^{-1}(x)$

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

VA: $x=0$

D: $\{x \mid x>0\}$

R: $\mathbb{R}$

$y = \left(\frac{1}{2}\right)^x$ 1-1 ✓

$x = \left(\frac{1}{2}\right)^y$

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

$f^{-1}(x) = \log_{\frac{1}{2}} x$

Graph the function and its inverse function. Find the domain and range of each. Find the inverse function.

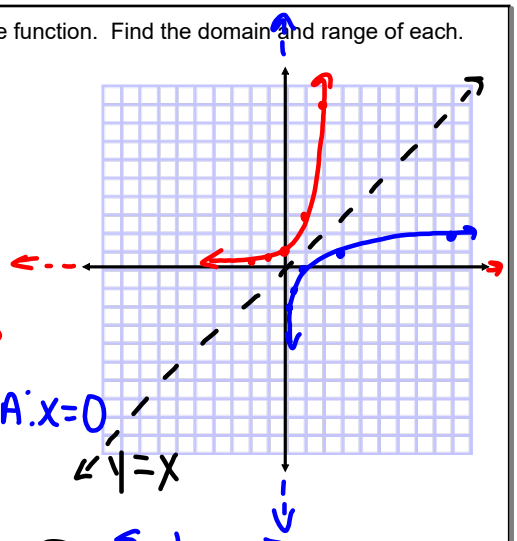
$f(x) = 3^x$

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

HA: $y=0$

D: $\mathbb{R}$

R: $\{y \mid y>0\}$



$f^{-1}(x)$ VA: $x=0$

$y=x$

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

D: $\{x \mid x>0\}$

R: $\mathbb{R}$

$y=3^x$ 1-1 ✓

$x=3^y$

$y=\log_3 x$

$f^{-1}(x)=\log_3 x$

Parent Function:

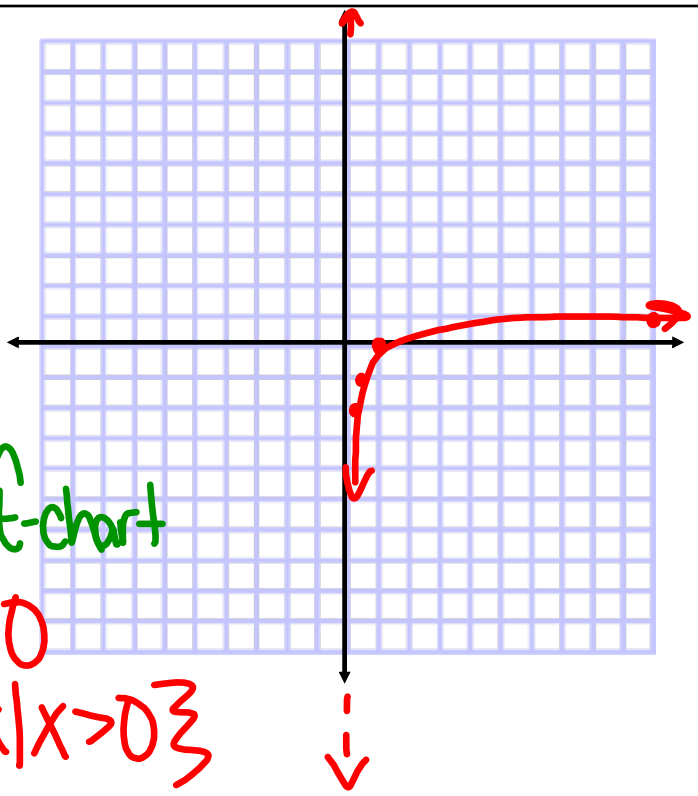
$f(x) = \log x$

$y=\log_{10} x$

$10^y = x$

exponent — fill in on the t-chart

x	y
$\frac{1}{100}$	-2
$\frac{1}{10}$	-1
1	0
10	1
100	2



VA: $x=0$

D: $\{x \mid x>0\}$

R: $\mathbb{R}$

Parent Function:

$f(x) = \ln x$

$y = \log_e x$

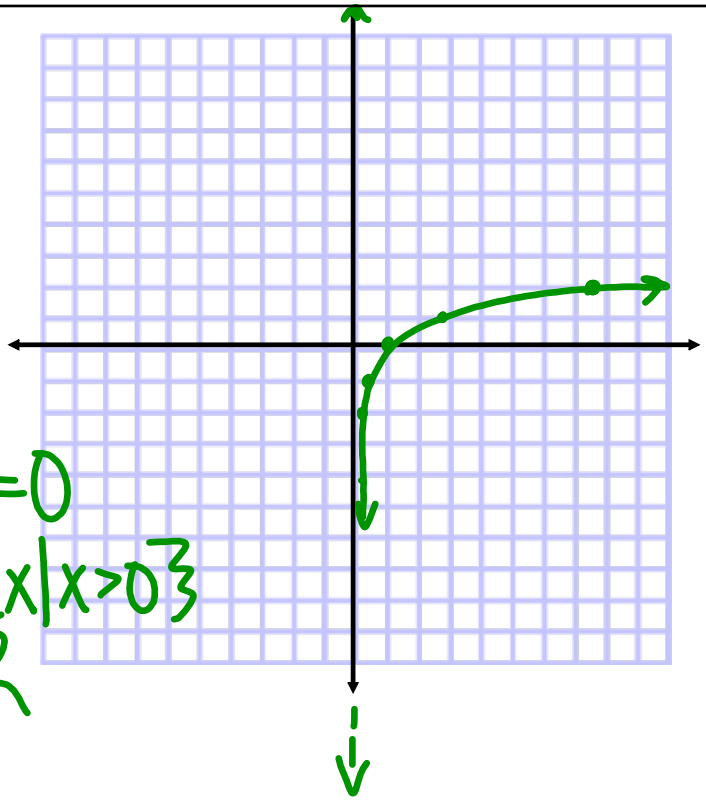
$e^y = x$

x	y
.135	-2
.368	-1
1	0
2.718	1
7.389	2

VA: $x = 0$

D: $\{x \mid x > 0\}$

R: $\mathbb{R}$



Transformations:

$f(x) = \log_a x$

"outside" - y-values

"inside" - x-values
* if the inside is NOT just "x," parentheses must be used *

1) reflection over *x*-axis

$f(x) = -\log_a x$

2) reflection over *y*-axis

$f(x) = \log_a(-x)$

3) vertical stretch/compression

$0 < c < 1$ v.c. by c

$c > 1$ v.s. by c

$f(x) = c\log_a x$

4) horizontal stretch/compression

$0 < c < 1$ h.s. by $\frac{1}{c}$

$c > 1$ h.c. by $\frac{1}{c}$

$f(x) = \log_a(cx)$

5) shift left/right

* factor if no just x

left: $f(x) = \log_a(x+c)$

right: $f(x) = \log_a(x-c)$

*Shift VA *

6) shift up/down

up: $f(x) = c + \log_a x$

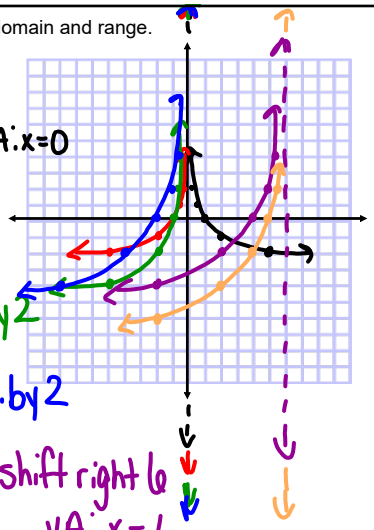
$f(x) = \log_a x + c$

down: $f(x) = -c + \log_a x$

$f(x) = \log_a x - c$

Graph using transformations. Find the domain and range.

$f(x)=2\log_{\frac{1}{2}}\left(3-\frac{1}{2}x\right)-2$



Parent: $f(x)=\log_{\frac{1}{2}}x$

1) $f(x)=\log_{\frac{1}{2}}(-x)$ ry

2) $f(x)=2\log_{\frac{1}{2}}(-x)$ v.s. by 2

3) $f(x)=2\log_{\frac{1}{2}}(-\frac{1}{2}x)$ h.s. by 2

4) $f(x)=2\log_{\frac{1}{2}}(-\frac{1}{2}(x-6))$ shift right 6

VA: $x=6$

5) $f(x)=2\log_{\frac{1}{2}}(3-\frac{1}{2}x)-2$ shift down 2

D: $\{x|x<6\}$

R: $\mathbb{R}$

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

$x=(\frac{1}{2})^y$

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

Graph using transformations. Find the domain and range.

1) $f(x)=-\ln(1-x)+1$

2) $f(x)=3\log_2(x+4)-2$

3) $f(x)=-\frac{1}{2}\log(2x+6)+2$

4) $f(x)=-2\ln(x-2)-1$

5) $f(x)=\frac{1}{4}\log_4(3-x)+4$