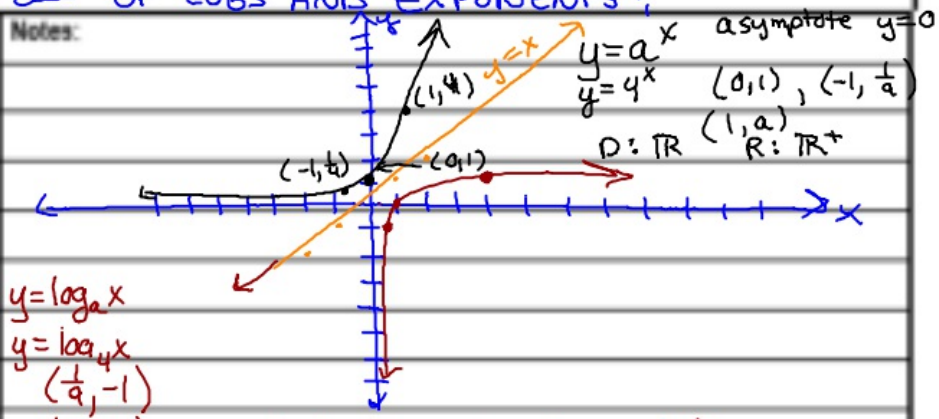
Cornell Notes | Topic/Objective: 4.2 Logarithmic Functions | Name: | Class/Period: 4 | Date: 2/8/17

Essential Question: How can we compare the graphs of logs and exponents?

Questions:

Notes:



$y = a^x$ asymptote $y=0$

$y = 4^x$ $(0,1)$, $(-1, \frac{1}{4})$, $(1,4)$

D: $\mathbb{R}$ R: $\mathbb{R}^+$

$y = \log_a x$

$y = \log_4 x$

$(\frac{1}{4}, -1)$

$(4, 1)$

$(1, 0)$

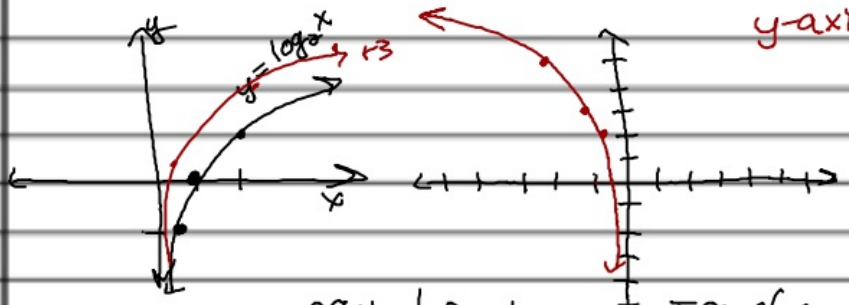
asymptote at $x=0$ (y-axis) vertical

D: $\mathbb{R}^+$ R: $\mathbb{R}$

TRANSFORMATIONS

Ex 1) Graph $g(x) = 3 + \log_2(-x)$

↑3 reflect over y-axis



original point	Transformed
$(\frac{1}{2}, -1)$	$(-\frac{1}{2}, 2)$
$(1, 0)$	$(-1, 3)$
$(2, 1)$	$(-2, 4)$

Questions:	Notes:
* log a means $\log_{10} a$	Ex 2) Graph $y = -2\log(x-1)$

vert reflect over x-axis; stretch vertically by -2; shift right 1 unit

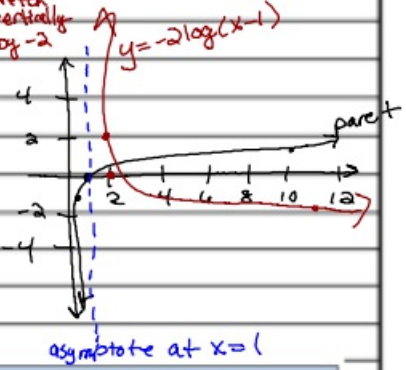
Pts for $\log x$

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

Pts for $y = -2\log(x-1)$

x	y
$1\frac{1}{10}$	2
2	0
11	-2

add 1 to x; multiply y by -2



Steps for Multiple Transformations

Use the following order to graph a function involving more than one transformation:

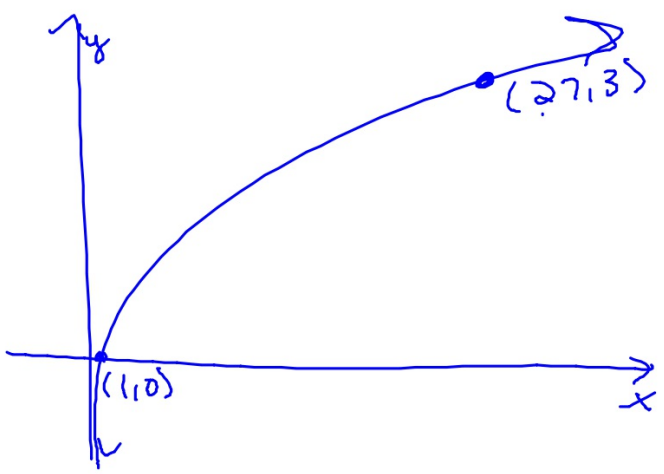
1. Horizontal Translation
2. Stretching or shrinking
3. Reflecting
4. Vertical Translation

HWJ p. 119 #1, 3, 4

Questions:	Notes:
	LOGS BASE 10 (calculator is set up for this)
	Ex) USE A CALCULATOR TO EVALUATE $\log 2 = .301$ (3 dp)
	LOGS BASE e
	$\log_e x$ is written $\ln x$ (this is the "Natural" log)
	Ex) EVALUATE $\frac{\ln 4}{\ln 2} = 2$
	Since $y = \ln x$ is the inverse of $y = e^x$
	• $\log_a(a^x) = x$ and $a^{\log_a x} = x$
$\ln x = \log_e x$	• $\ln(e^x) = x$ and $e^{\ln x} = x$
	$\log_e(e^x) = x$
	• $\log_{10}(10^x) = x$ and $10^{\log x} = x$
	WE CAN USE THIS RELATIONSHIP TO SOLVE EQUATIONS! (YAY!) BY TAKING EITHER THE LOG OF BOTH SIDES OR RAISING BOTH SIDES.
	Ex a) Solve $e^x = 2.3$ $\ln(e^x) = \ln(2.3)$ $x = \ln(2.3)$ $x = 0.833$
	Ex b) $\ln x = -1.5$ $e^{\ln x} = e^{-1.5}$ $x = e^{-1.5}$ $x = .223$
	Ex c) $10^x = 0.75$ $\log(10^x) = \log(.75)$ $x = -.125$
	Ex d) $\log_x = 3$ $10^{\log x} = 10^3$ $x = 10^3$ $x = 1000$
	HW6: 4K p.120 #1 4L p.122 #1-9

Questions:	Notes:

#4



$a = ?$

$\log_a x = y$

$\log_a 27 = 3$

$\sqrt[3]{a^3} = \sqrt[3]{27}$

$a = 3$