2.5 GUIDED NOTES: Logarithmic and Exponential Functions Graphs

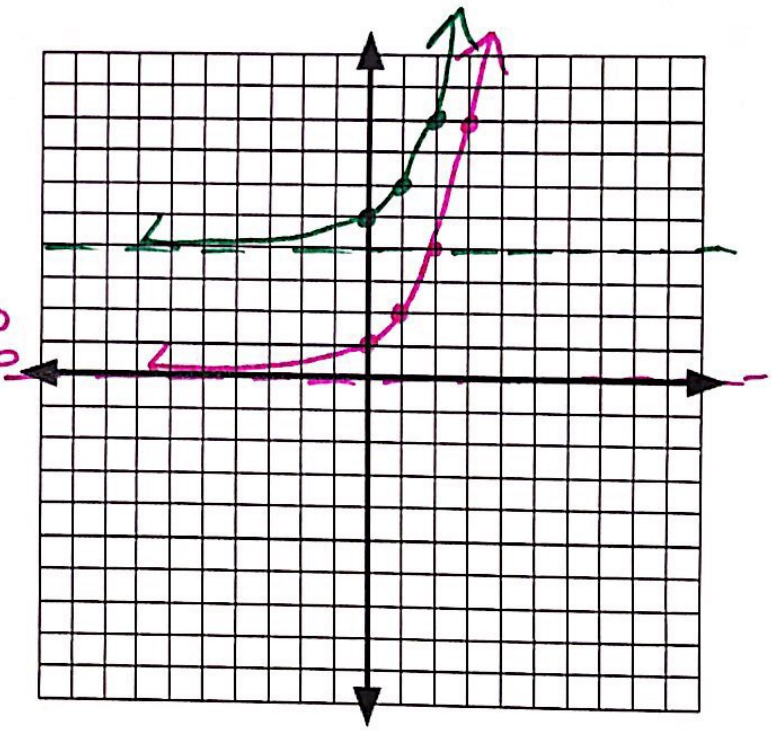
Horizontal Asymptote - an "invisible" line that the graph of a function never crosses (always $y = \#$)

Transformations on a parent function:

Reflection	$g(x) = -b^x$	Reflects graph over x-axis	$y = -\log_b x$
Vertical Stretch narrow	$g(x) = ab^x$	$a > 1$	$y = a\log_b x$
Vertical Shrink widen	$g(x) = ab^x$	$a < 1$	↓
Vertical Shift	$g(x) = b^x + k$	Shifts graph up k units	$y = \log_b x + k$
	$g(x) = b^x - k$	Shifts graph down k units	$y = \log_b x - k$
Reflection	$g(x) = b^{-x}$	Reflects graph over y-axis	$y = \log_b(-x)$
Horizontal Shrink narrow	$g(x) = b^{cx}$	$c > 1$	$y = \log_b(cx)$
Horizontal Stretch widen	$g(x) = b^{cx}$	$c < 1$	
Horizontal Shift	$g(x) = b^{x+d}$	Shifts graph d units left	$y = \log_b(x+d)$
	$g(x) = b^{x-d}$	Shifts graph d units right	$y = \log_b(x-d)$

EX1. Graph $f(x) = 2^x$

domain:	$(-\infty, \infty)$
range:	$(0, \infty)$
HA:	$y = 0$
y-intercept:	$(0, 1)$
end behavior:	as $x \to -\infty$, $y \to 0$ as $x \to \infty$, $y \to \infty$



EX2. Graph $f(x) = 2^x + 4$

transformations:	up 4
domain:	$(-\infty, \infty)$
range:	$(4, \infty)$
HA:	$y = 4$
y-intercept:	$(0, 5)$
end behavior:	as $x \to -\infty$, $y \to 4$ as $x \to \infty$, $y \to \infty$

EX3. Find the inverse of $f(x) = 4^{x+9} - 8$

$y = 4^{x+9} - 8$

$x = 4^{y+9} - 8$

$(x+8) = 4^{y+9}$

$\log_4(x+8) = y+9$

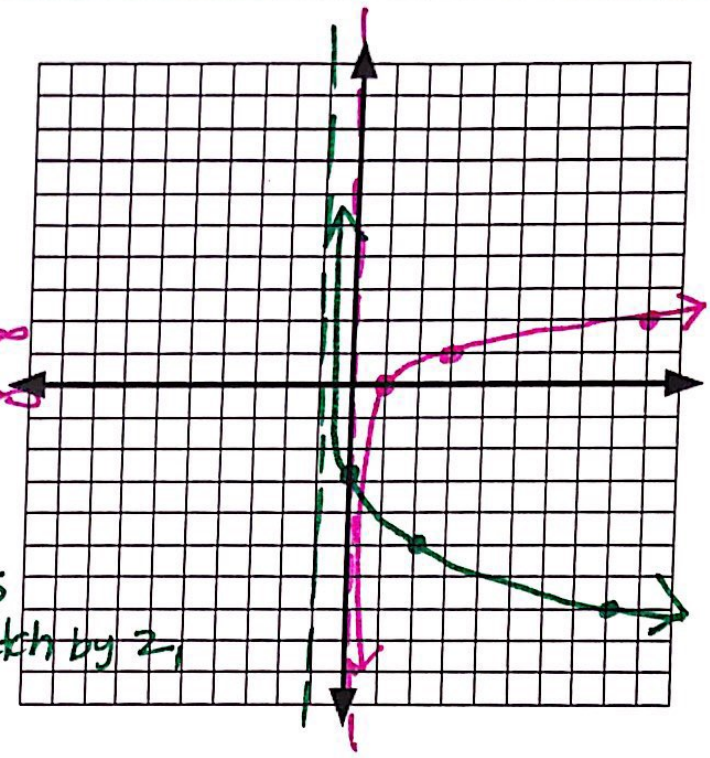
$\log_4(x+8) - 9 = y$

$f^{-1}(x) = \log_4(x+8) - 9$

The inverse of an exponential function is a logarithmic function **!!!**

EX4. Graph $f(x) = \log_3 x$

domain:	$(0, \infty)$
range:	$(-\infty, \infty)$
VA:	$x = 0$
y-intercept:	none
end behavior:	as $x \to -\infty$, $y \to -\infty$ as $x \to \infty$, $y \to \infty$



EX5. Graph $f(x) = -2\log_3(x+1) - 3$

transformations:	reflect over x-axis left 1, vertical stretch by 2, down 3
domain:	$(-1, \infty)$
range:	$(-\infty, \infty)$
VA:	$x = -1$
y-intercept:	$(0, -3)$
end behavior:	as $x \to -\infty$, $y \to \infty$ as $x \to \infty$, $y \to -\infty$