Algebra II 6.4 Key features of log graphs

Obj: Graph log functions and find equations of inverses

Exponential and Logarithmic Functions

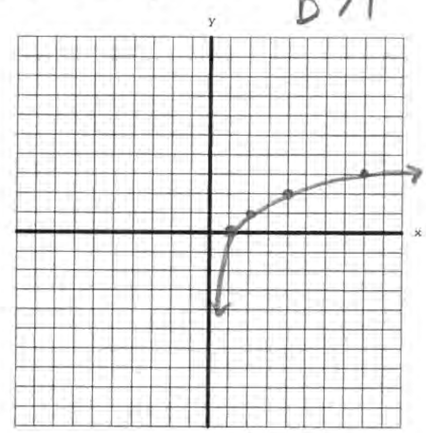
The inverse of an exponential function is called a log function.

Example 1: Graphing a Logarithmic Function

What is the graph of $y = \log_2 x$? Describe the domain, range, x intercept and asymptotes.

Steps: Rewrite as exp. $2^y = x$

$b > 1$



Choose y values (0, 1, 2) instead of x to make it easier.

Points for the log graph.

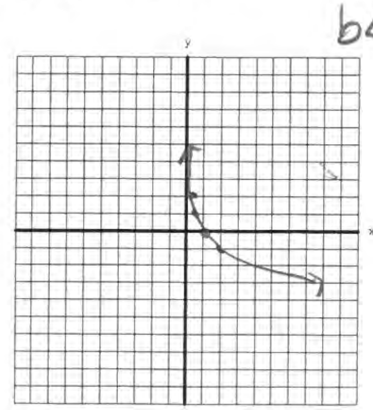
x	y
1	0
2	1
4	2
8	3

choose these

Asymptote is: $x=0$

Domain: $(0,\infty)$ Range: $(-\infty,\infty)$ x intercept: $(1,0)$

$b < 1$



You try. Graph $y = \log_{1/2} x$

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

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

Asymptote is:

Domain: $(0,\infty)$

Range: $(-\infty,\infty)$

x intercept: $(1,0)$

Graph $y = ln\, x$ $e^y = x$

x	y
1	0
e	1
e^2	2

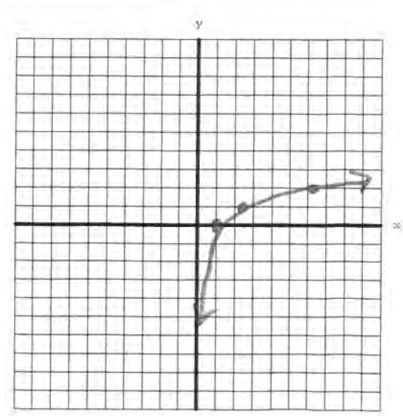
$2.7 \approx e$

Asymptote is: $x=0$

Domain: $(0,\infty)$

Range: $(-\infty,\infty)$

x intercept: $(1,0)$



How does the graph of each function compare to the graph of the parent function? Include any changes to the domain and range.

a. $y = \log_2(x-3)+4$

rt 3 up 4

b. $y = 5\log_2 x$

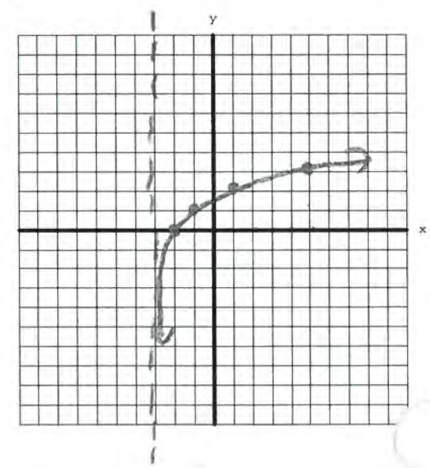
stretch /mult. by 5

Example 2. Graph transformations. $y = \log_2(x+3)$ left 3

$2^y = x+3$

$2^y - 3 = x$

x	y
-2	0
-1	1
1	2
5	3



Asymptote is: $x = -3$

Domain: $(-3, \infty)$

Range: $(-\infty, \infty)$

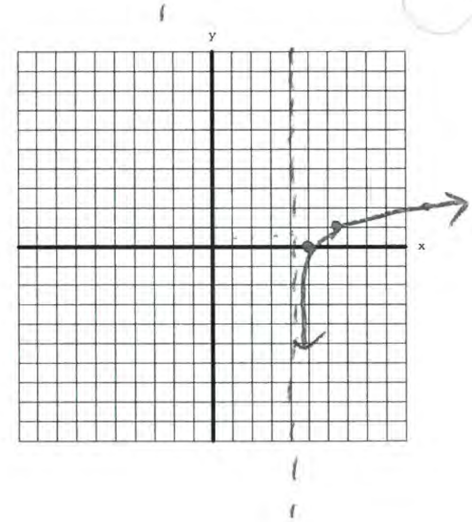
x intercept: $(-2, 0)$

You try. Graph transformations. $y = \ln(x-4)$ rt 4

$e^y = x-4$

$e^y + 4 = x$

x	y
5	0
4+e	1
$4+e^2$	2



Asymptote is: $x = 4$

Domain: $(4, \infty)$

Range: $(-\infty, \infty)$

x intercept: $(5, 0)$

Example 3. Finding inverses.

a. What is the equation of the inverse of $f(x)=10^{x+1}$

$x = 10^{y+1}$

$\log x = \log 10^{y+1}$

$\log x = y+1$

$\log x - 1 = y$

b. $g(x)=\log_7(x+5)$

$x = \log_7(y+5)$

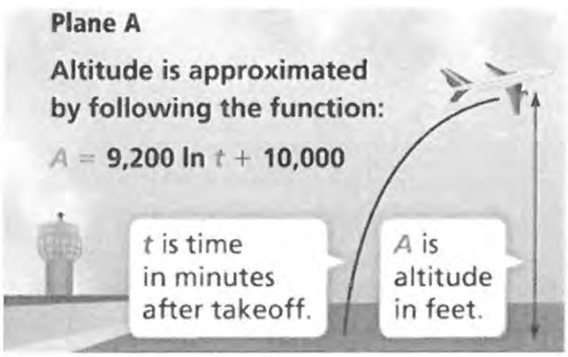
$7 \quad 7$

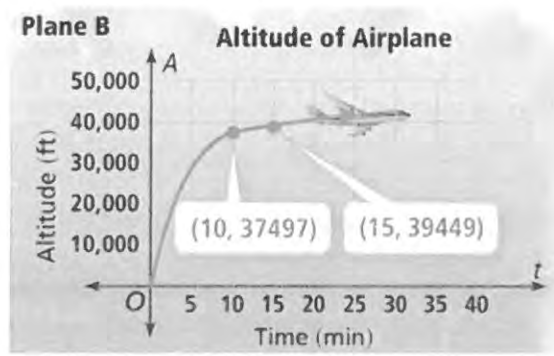
$7^x = y+5$

$\boxed{7^x - 5 = y}$

Example 5. Compare two log graphs.

Logarithmic functions can approximate the altitude of a plane over time. Which plane's altitude shows the greater rate of change over the interval $10 \le t \le 15$





$A(10) = 9200 \ln 10 + 10000$

$A(15) = 9200 \ln 15 + 10000$

$\frac{34914 - 31184}{15-10} \approx 746$ ft/min

↓

greater avg rate of change

$B(10) = 37497$

$B(15) = 39449$

$\frac{37497 - 39449}{15-10} \approx 390$ ft/min