

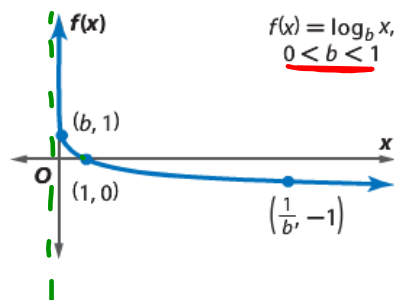
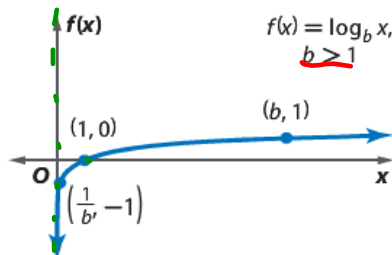
7-3C Graphing Logarithmic Functions

- graph logarithmic functions
- analyze transformations of graphs of parent logarithmic functions
- F.IF.7e, F.BF.3

9^2 $\sqrt[3]{144}$
 $\log_3 27$

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 $x > 0$	Range:	all real numbers
Asymptote:	$f(x)$ -axis $x = 0$	Intercept:	(1, 0)



$\log_{27} 3$

$\log_{27} 27^{1/3}$

$27^? = 3$
 $(3^3)^y = 3^1$
 $3y = 1$
 $y = 1/3$

Sketch the following logarithmic functions. Then state the domain and range.

$b > 1$ 

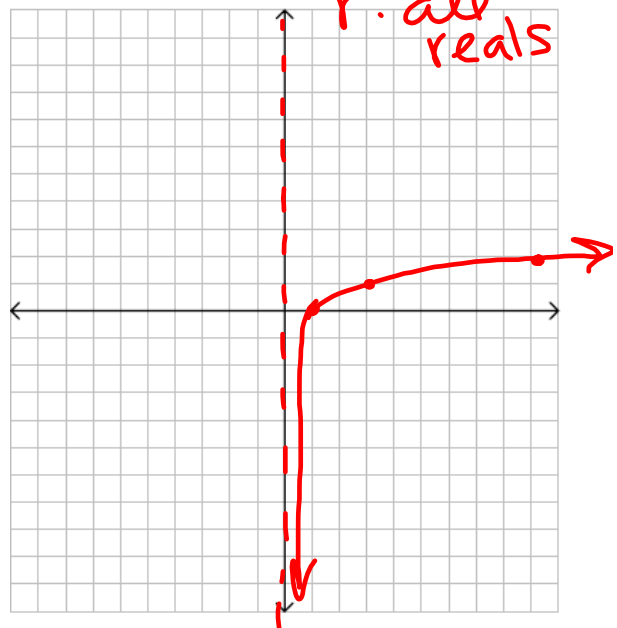
1. $f(x) = \log_3 x$

$3^0 = 1$
 $3^1 = 3$
 $3^2 = 9$

x	y
1	0
3	1
9	2

$y = \log_3 1$
 $y = \log_3 3$
 $y = \log_3 9$
 $y = \log_3 3$

$\therefore d: x > 0$
 $r: \text{all reals}$



Sketch the following logarithmic functions. Then state the domain and range.

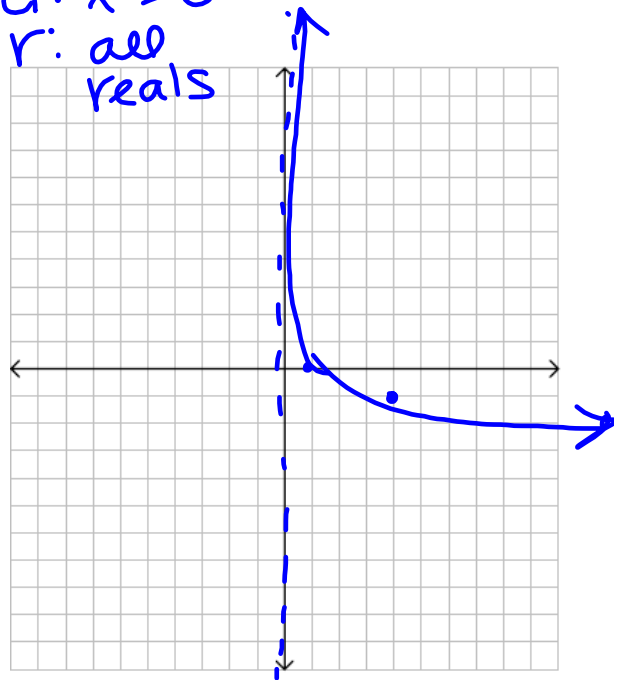
$0 < b < 1$

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

x	y
1	0
4	-1
16	-2

$4^0 = 1 \quad y = \log_{\frac{1}{4}} 1$
 $4^1 = 4 \quad y = \log_{\frac{1}{4}} 4$
 $4^2 = 16 \quad y = \log_{\frac{1}{4}} 16$

d: $x > 0$
r: all reals



KeyConcept Transformations of Logarithmic Functions

$f(x) = a \log_b(x - h) + k$

h – Horizontal Translation

h units right if h is positive
 $|h|$ units left if h is negative

V.A. $x = h$

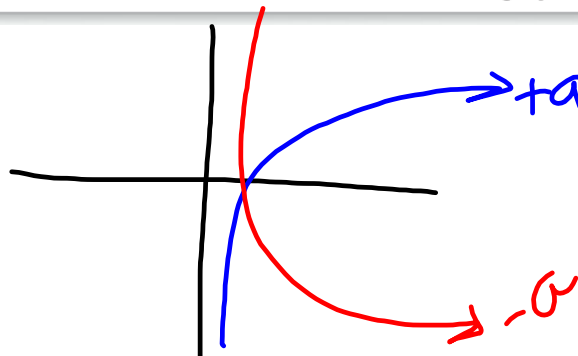
k – Vertical Translation

k units up if k is positive
 $|k|$ units down if k is negative

a – Orientation and Shape

If $a < 0$, the graph is reflected across the x -axis.

If $|a| > 1$, the graph is stretched vertically.
If $0 < |a| < 1$, the graph is compressed vertically.



Describe the transformations of the parent function. Then sketch a graph. Determine the domain and range of the function.

3. $f(x) = \frac{1}{3} \log_6 x - 1$ $b > 1$ →

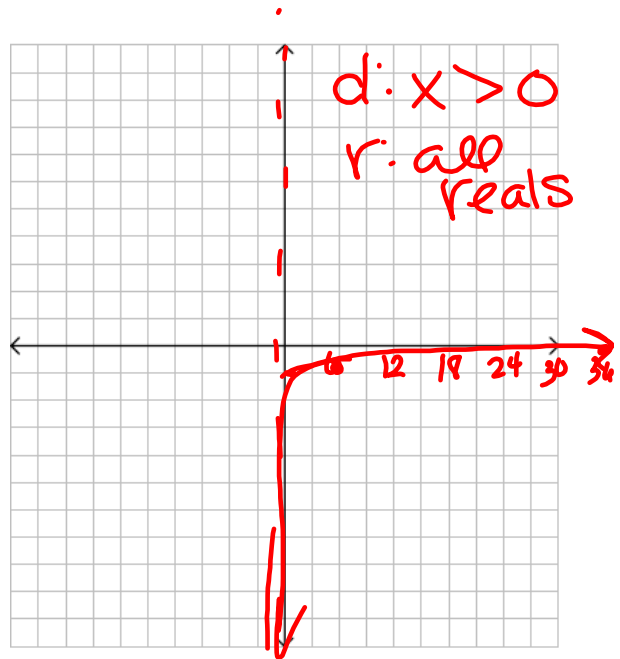
Compress vertically

translates down 1 unit.

$6^0 = 1$
 $6^1 = 6$
 $6^2 = 36$

~~$y = \frac{1}{3} \log_6 x - 1$~~
 ~~$y = \frac{1}{3} \log_6 6 - 1$~~
 ~~$y = \frac{1}{3} \log_6 36 - 1$~~

x	y
1	-1
6	-2/3
36	-1/3



Describe the transformations of the parent function. Then sketch a graph. Determine the domain and range of the function.

4. $f(x) = 4 \log_3 (x+2)$ $0 < b < 1$ →

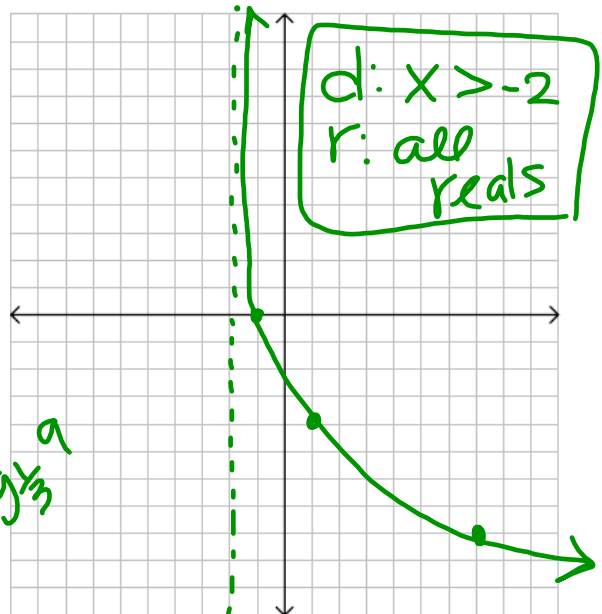
stretches vertically

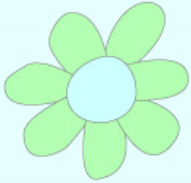
translates left 2 units

$3^0 = 1$
 $3^1 = 3$
 $3^2 = 9$

~~$y = 4 \log_3 (x+2)$~~
 ~~$y = 4 \log_3 3 - 1$~~
 ~~$y = 4 \log_3 9 - 1$~~

x	y
-1	0
1	4
7	8





7-3C Worksheet

Attachments

10-1A Key.notebook