

Graph  $f(x) = 2^x$

and

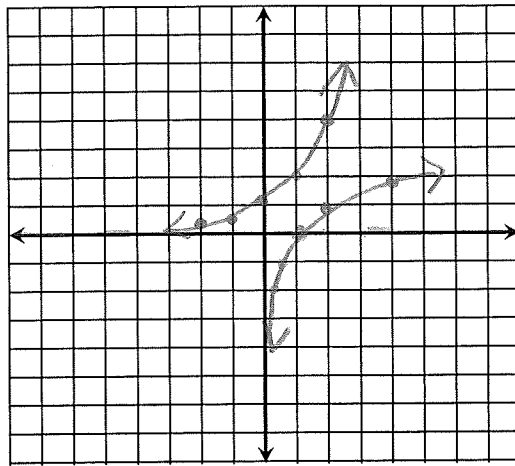
$f(x) = \log_2 x$

$y = \log_2 x$   
 $2^y = x$

x	y
-2	1/4
-1	1/2
0	1
1	2
2	4

x	y
1/4	-2
1/2	-1
1	0
2	1
4	2

Domain: all n  
Range:  $y > 0$   
Asymptote:  $y = 0$   
Y intercept: (0, 1)



Domain:  $x > 0$   
Range: all n  
Asymptote:  $x = 0$   
X intercept: (1, 0)

What do you notice about these two graphs? inverses

Examples: A. Describe the transformations

- $f(x) = \log x$  parent
- $f(x) = \log(x-1)$  1 right
- $f(x) = 2 + \log x$  2 up
- $f(x) = \log(-x) - 3$  3 down, flip over y
- $f(x) = -3 \log(x-4)$  r.o axis, v.s by 3, 4 right

B. State the domain and the range. (interval notation)

- d:  $(0, \infty)$  r:  $(-\infty, \infty)$
- d:  $(1, \infty)$  r:  $(-\infty, \infty)$
- d:  $(0, \infty)$  r:  $(-\infty, \infty)$
- d:  $(-\infty, 0)$  r:  $(-\infty, \infty)$

In  $y = 2^x + 4$   
This big number changes the Asymptote and the range.  
Y=4

$y = \log_2(x+3)$   
This changes the domain  
D:  $(-3, \infty)$  Asymptote:  $x = -3$   
R:  $(-\infty, \infty)$   
Example: Graph  $f(x) = -3 \log x$

6. **Example:** Describe the transformation  $f(x) = -3 \log_2 \left( \frac{1}{2}x + 1 \right) - 1$

$$y = \log_2 x$$

$$2^y = x$$

Parent function  $f(x) = \log_2 x$

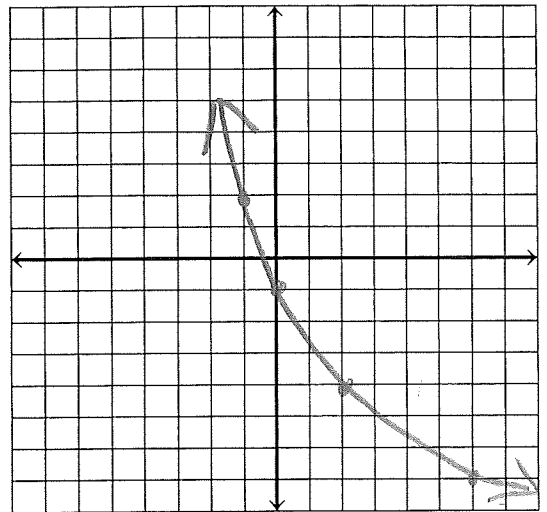
Rewrite the equation:

$$y = -3 \log_2 \left( \frac{1}{2}(x+2) \right) - 1$$

List the transformation:

- Horizontal stretch by 2  
(Take x and mult by 2)
  - 2 left (x-2)
  - r.o x axis
  - v. stretch by 3
  - 1 down
- } mult y by -3  
y-1

Type:		mult x by 2		x-2		y.-3		y-1	
x	y	x	y	x	y	x	y	x	y
1/2	-1	1	-1	-1	-1	-1	3	-1	2
1	0	2	0	0	0	0	0	0	-1
2	1	4	1	2	1	2	-3	2	-4
4	2	8	2	6	2	6	-6	6	-7

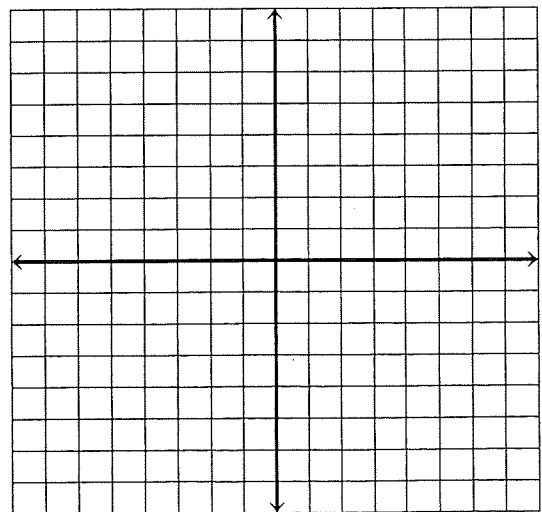


**Sketch a complete graph:**

For Exercises 7-11, complete the table, and graph each function on the grid provided.

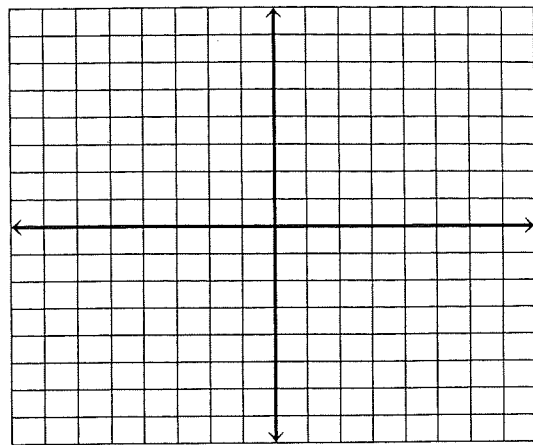
7.  $f(x) = \log_2(x-3)$

Type:					
x	y				



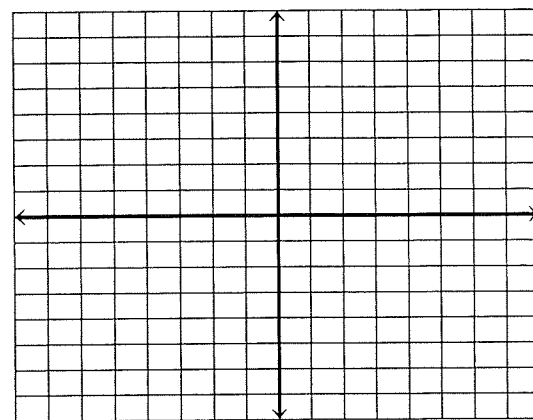
8.  $f(x) = 2 \log_2 x - 1$

Type:				
$x$	$y$			



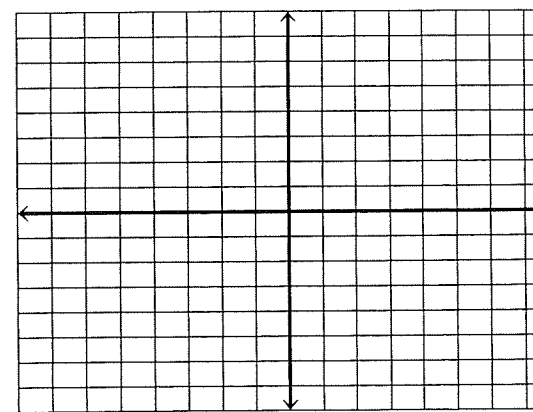
9.  $y = -2 \log_2 x + 1$

Type:				
$x$	$y$			



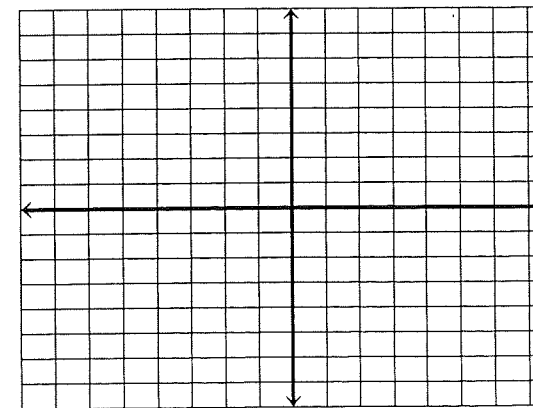
10.  $f(x) = 2 \log_2(x+3) - 4$

Type:				
$x$	$y$			



11.  $f(x) = 1 - \log_2(2x)$

Type:				
$x$	$y$			



In Exercises 37–40, find the domain of the given function.

37.  $f(x) = \ln(x + 1)$

38.  $g(x) = \ln(x + 2)$

39.  $h(x) = \log(-x)$

40.  $k(x) = \log(2 - x)$

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41. Compare the graphs of  $f(x) = \log x^2$  and  $g(x) = 2 \log x$ . How are they alike? How are they different?

42. Compare the graphs of  $h(x) = \log x^3$  and  $k(x) = 3 \log x$ . How are they alike? How are they different?

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In Exercises 43–48, describe the transformation from  $g(x) = \ln x$  to the given function. Give the domain and range of the given function.

43.  $f(x) = 2 \ln x$

44.  $f(x) = \ln x - 7$

45.  $h(x) = \ln(x - 4)$

46.  $k(x) = \ln(x + 2)$

47.  $h(x) = \ln(x + 3) - 4$

48.  $k(x) = \ln(x - 2) + 2$

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