Graphing logarithmic functions

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Graphs of Logarithmic Functions

Find the inverse of $y = 2^x$. (Remember, switch x & y. Then solve for y.)

Graph $y = 2^x$ and $y = \log_2 x$ on the same coordinate plane.

$y = 2^x$

X	Y
3	8
2	4
1	2
0	1
-1	½
-2	¼
-3	⅛

$y = \log_2 x$

X	Y
8	3
4	2
2	1
1	0
½	-1
¼	-2
⅛	-3

(1, 0)

(1, 2)

(-1, ½)

y = x

What do you notice about $y = 2^x$ and $y = \log_2 x$?

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General Logarithmic Function $y = \log_b (x - h) + k$

- Sketch the vertical asymptote with a dashed line (x = h)
- Use a t-chart to sketch the graph of $y = \log_b x$
- Shift the graph
  - h units horizontally
  - k units vertically

$y = \log_3 x - 2$

D: $(0, \infty)$

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

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1. $y = \log_3 x - 2$

Asymptote _____

Domain _____

Range _____

3^x

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2. $y = \log_3 (x - 2)$

Asymptote $x = 2$

Domain $(2, \infty)$

Range $(-\infty, \infty)$

$x = \log_3 (y - 2)$

$3^x = y - 2$

$3^x + 2 = y$

OR

$y = 3^x$

x	y
0	3
1	5
-1	2⅓

x	y
3	0
5	1
2⅓	-1

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3. $y = \log_{1/3} x$

Asymptote $x = 0$

Domain $(0, \infty)$

Range $(-\infty, \infty)$

$x = \log_{1/3} y$

$\left(\frac{1}{3}\right)^x = y$

x	y
0	1
1	⅓
-1	3

$y = \left(\frac{1}{3}\right)^x$ or $\log_{1/3} x$

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4. $y = \log_{1/3}(x+1) - 2$

Asymptote $x = -1$

Domain $(-1, \infty)$

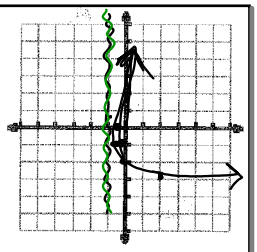
Range $(-\infty, \infty)$ or $\mathbb{R}$

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

$(0, \frac{1}{9} - \frac{9}{9})$

$(0, -\frac{8}{9})$

$\frac{1}{27} - 1$



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5. $y = \log_2 x + 3$

Asymptote $x = 0$

Domain $(0, \infty)$

Range $(-\infty, \infty)$

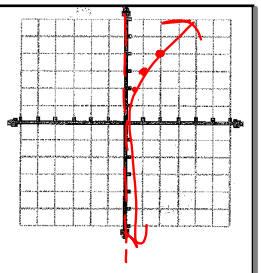
$x = \log_2 y + 3$

$x - 3 = \log_2 y$

$2^{x-3} = y$

2^{-3}

x	y
0	1/8
3	1
4	2



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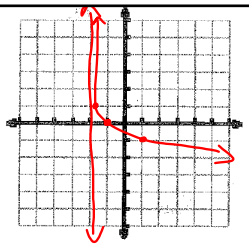
6. $y = \log_{1/4}(x + 2)$

Asymptote $x = -2$

Domain $(-2, \infty)$

Range $(-\infty, \infty)$



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Homework

#2,4,7, 8,11,12,14,16, 18, 20

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