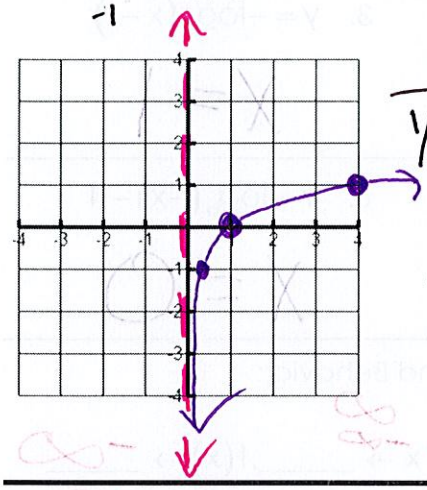
Name: _____ Date: _____

$-1 = \log_4 x$

1. $y = \log_4 x$



x	y
1/4	-1
1	0
4	1

State 3 points on Graph (.25, -1) (1, 0) (4, 1)

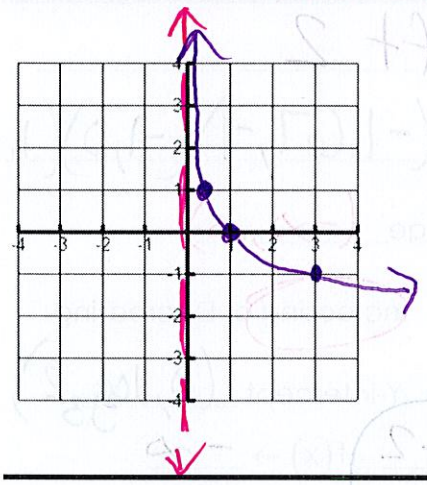
Domain $(0, \infty)$ Range $(-\infty, \infty)$

Asymptote $x = 0$ Increasing or Decreasing

X-intercept (1, 0) Y-intercept n/a

End Behavior $x \to 0$, $f(x) \to -\infty$; $x \to \infty$, $f(x) \to \infty$

2. $y = \log_{\frac{1}{3}} x$



x	y
3	-1
1	0
1/3	1

State 3 points on Graph $(3, -1) (1, 0) (\frac{1}{3}, 1)$

Domain $(0, \infty)$ Range $(-\infty, \infty)$

Asymptote $x = 0$ Increasing or Decreasing $(0, \infty)$

X-intercept (1, 0) Y-intercept n/a

End Behavior $x \to 0$, $f(x) \to \infty$; $x \to \infty$, $f(x) \to -\infty$

Transformations:

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

h → right (−) or left (+)

k → up (+) down (−)

Reflects: negative outside → reflect x-axis; negative inside → reflect y-axis

(+) right (−) left

Examples:

1. $y = \log_b (x + 2)$ — left 2

2. $y = \log_b (x) + 5$ — up 5

3. $y = -\log_b (x - 1)$ — • reflect x • right 1

4. $y = \log_b (-x + 3)$ — * reflect y-axis * right 3

5. $y = -\log_b (x + 2) - 7$ — • reflect x-axis • left 2 • down 7

6. $y = \log_b (-x) - 4$ — • reflect y • down 4

Asymptote: $x = h$

Examples:

1. $y = \log_b(x+2)$ — $x+2=0$, $x=-2$
2. $y = \log_b(x)+5$ — $x=0$
3. $y = -\log_b(x-1)$ — $x=1$
4. $y = \log_b(-x+3)$ — $-x+3=0$, $-x=-3$, $x=3$
5. $y = -\log_b(x+2)-7$ — $x=-2$
6. $y = \log_b(-x)-4$ — $x=0$

Domain: (h,∞) or $(-\infty,h)$ * reflect y-axis

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

End Behavior: $x \to$ h, $f(x) \to -\infty$ / $x \to \infty$, $f(x) \to \infty$ Domain

3. $y = \log_3(x+2)$

Transformations: left 2

x	y
$\frac{1}{3}-2$	−1
1−2	0
3−2	1

State 3 points on Graph: $(-1.67,-1)(-1,0)(1,1)$

Domain $(-2,\infty)$ Range $(-\infty,\infty)$

Asymptote $x=-2$ Increasing or Decreasing

X-intercept $(-1,0)$ Y-intercept $(0, \log_3 2)$

End Behavior: $x \to -2$, $f(x) \to -\infty$ / $x \to \infty$, $f(x) \to \infty$

4. $y = \log_2(x+3)-1$

Transformations: left 3, down 1

x	y
$\frac{1}{2}-3$	−1 −1
1−3	0 −1
2−3	1 −1

$y = \log_2(0+3)-1$

$y = \log_2 3 - 1$

State 3 points on Graph: $(-2.5,-2)(-2,-1)(-1,0)$

Domain $(-3,\infty)$ Range $(-\infty,\infty)$

Asymptote $x=-3$ Increasing or Decreasing

X-intercept $(-1,0)$ Y-intercept $(0, \log_2(3)-1)$

End Behavior: $x \to -3$, $f(x) \to -\infty$ / $x \to \infty$, $f(x) \to \infty$