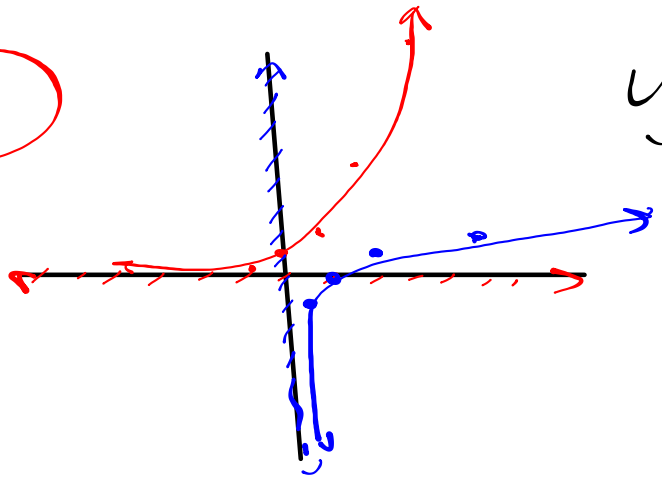
Graph

$y = 2^x$

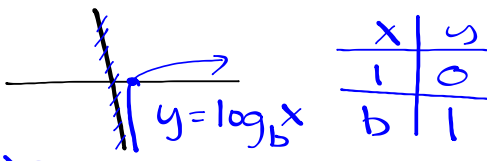
x	y
-1	1/2
0	1
1	2
2	4
3	8



$y = \log_2 x$

x	y
1/2	-1
1	0
2	1
4	2
8	3

Graphing Logs



$y = \log_b x$

x	y
1	0
b	1

$y = \log_3 x$

x	y
1	0
3	1

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

- a: Vertical Stretch; $a < 0$ ref. over x-axis
- b: base

x	y
1	0
b	1

- h: hor. shift ⇄
- k: Vert Shift ↑↓

Domain: $(-\infty, h) \cup (h, \infty)$

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

Vertical Asymptote $x = h$

x int: $(x, 0)$

y int: $(0, y)$

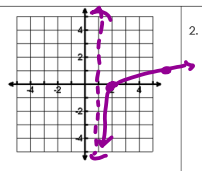
Recall Change of Base

$\log_b a = \frac{\log a}{\log b}$

$y = 2\log_3(x+1) - 7$

$y = 2 \cdot \frac{\log(x+1)}{\log 3} - 7$

1. $y=\log_3(x-1)$



Transformations right 1

State 3 points on Graph (2,0) (6,1)

Domain (1,∞) Range (-∞,∞)

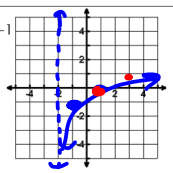
Asymptote x=1

X-intercept (2,0) Y-intercept none

Increasing or Decreasing

End Behavior $x\to 1, f(x)\to -\infty$; $x\to \infty, f(x)\to \infty$

2. $y=\log_3(x+2)-1$



Transformations left 2 down 1

State 3 points on Graph (-1,-1) (1,0)

Domain (-2,∞) Range (-∞,∞)

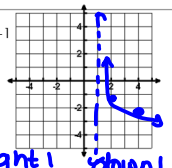
Asymptote x=-2

X-intercept (1,0) Y-intercept (0,-.4)

Increasing or Decreasing

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

3. $y=-\log_3(x-1)-1$



Transformations right 1 ref. over x. down 1

State 3 points on Graph (2,-1) (4,-2)

Domain (1,∞) Range (-∞,∞)

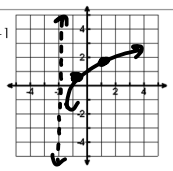
Asymptote x=1

X-intercept $(\frac{4}{3},0)$ -intercept none

Increasing or Decreasing

End Behavior $x\to 1, f(x)\to \infty$; $x\to \infty, f(x)\to -\infty$

4. $y=\log_3(x+2)+1$



Transformations left 2 up 1

State 3 points on Graph (-1,1) (1,2)

Domain (-2,∞) Range (-∞,∞)

Asymptote x=-2

X-intercep $(-\frac{5}{3},0)$ -intercept (0,1.6)

Increasing or Decreasing

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

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

Find the transformations:

1. $y=\log_b(x+2)$ — left 2

2. $y=\log_b(x)+5$ — up 5

3. $y=-\log_b(x-1)$ — right 1, ref. over x-axis

4. $y=\log_b(-x+3)$ — $y=\log_b(-1(x-3))$, ref. over y axis; right 3

5. $y=-\log_b(x+2)-7$ — ref. over x, left 2, down 7

6. $y=\log_b(-x)-4$ — ref. over y, down 4

Find the asymptotes:

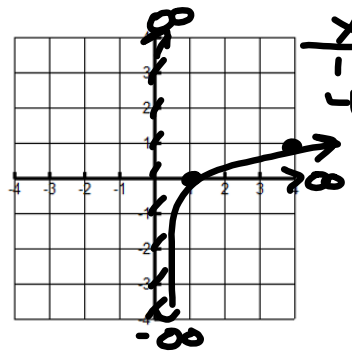
7. $y=\log_b(x+2)$ — $x+2=0$, $x=-2$

8. $y=\log_b(x)+5$ — $x=0$

9. $y=-\log_b(x-1)$ — $x-1=0$, $x=1$

$x=h$ Set arg $=0$ & solve.

10. $y = \log_4 x$



x	y
1	0
4	1

State 3 points on Graph (1,0) (4,1)

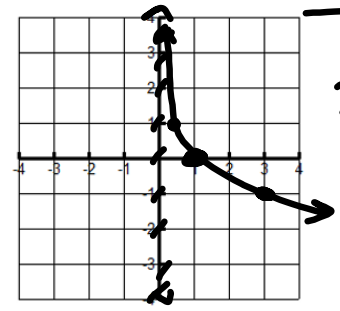
Domain (0,∞) Range (-∞,∞)

Asymptote x=0 Increasing or Decreasing

X-intercept (1,0) Y-intercept none

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

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



x	y
1	0
3	-1
⅓	1

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

x	y
-1	3
0	1
1	⅓

State 3 points on Graph (1,0) (3,-1) (⅓,1)

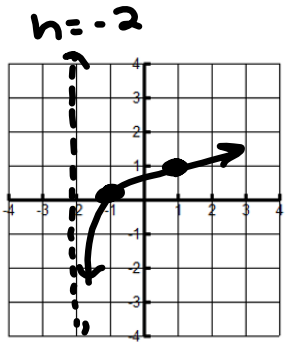
Domain (0,∞) Range (-∞,∞)

Asymptote x=0 Increasing or Decreasing

X-intercept (1,0) Y-intercept none

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

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



h: -2

x	y
-1	0
3	1

x	y
-2	-1
-1	0
1	1

x: -2

$y = \log_3 2 = \frac{\log 2}{\log 3} = .63$

Transformations: left 2

State 3 points on Graph (-1, 0) (1, 1)

Domain (-2, ∞) Range (-∞, ∞)

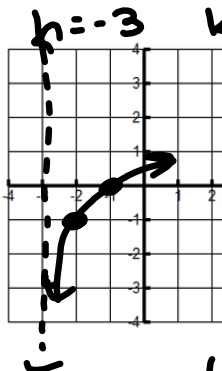
Asymptote x = -2 increasing or Decreasing

X-intercept (-1, 0) Y-intercept (0, .63)

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

$x \to \infty$, $f(x) \to \infty$

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



h: -3 k: -1

x	y
-2	-1
-1	0
1	0
2	1

x: -3

$y = \frac{\log 3}{\log 2} - 1$

Transformations: left 3 down 1

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

Domain (-3, ∞) Range (-∞, ∞)

Asymptote x = -3 increasing or Decreasing

X-intercept (-1, 0) Y-intercept (0, .58)

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

$x \to \infty$, $f(x) \to \infty$

$e \approx 2.7$

1. $y = \ln(x)$ $= \log_e x$

Transformations: none

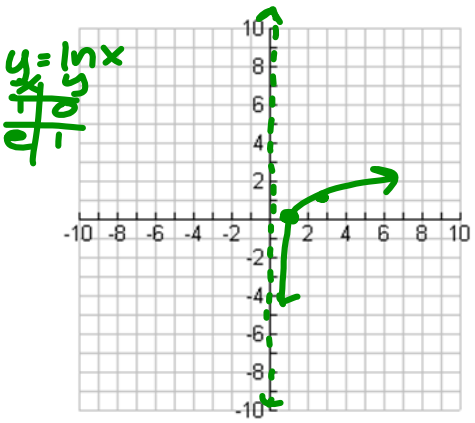
Domain: $(0,\infty)$ Range: $(-\infty,\infty)$

Asymptote: $x=0$ Inc or Dec

X-Int: $(1,0)$ Y-Int: none

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

$x \to \infty$, $f(x) \to \infty$



2. $y = e^x$

x	y
0	1
1	$e \approx 2.7$

Transformations: none

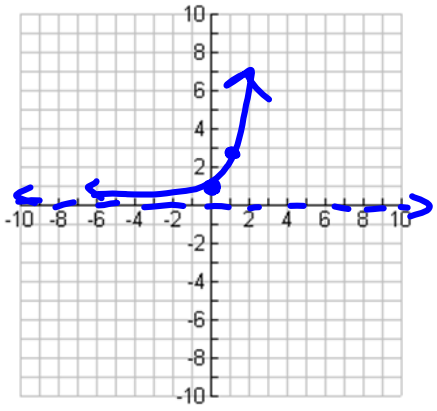
Domain: $(-\infty,\infty)$ Range: $(0,\infty)$

Asymptote: $y=0$ Inc or Dec

X-Int: none Y-Int: $(0,1)$

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

$x \to \infty$, $f(x) \to \infty$



$0 = -3^x + 2$

$-2 = -3^x$

$2 = 3^x$

$x = \log_3 2$

$x = \frac{\log 2}{\log 3}$

It's on the x-axis

$x = \frac{1}{4}$

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

x	y
1	0
1/3	1
3	-1

It's on the y-axis

$y = x + 2$

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

3. $y = \ln(x+2)-1$ $h=-2$ $k=-1$

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

Transformations: left 2 down 1

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

Asymptote: $x=-2$ Inc or Dec

X-Int: $(.7,0)$ Y-Int: $(0,-.3)$

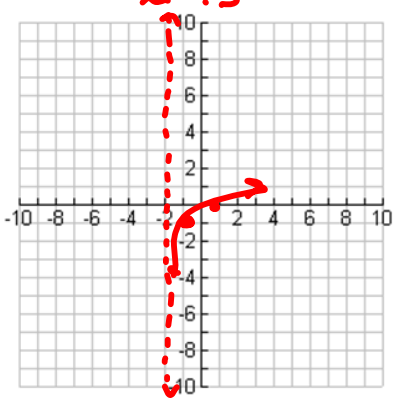
x	y
1	0
e	1

x	y
-1	-1
.7	0

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

$x \to \infty$, $f(x) \to \infty$

$y = \ln 2 - 1 \approx -.3$



4. $y = e^{x-2}+1$

Transformations: _____

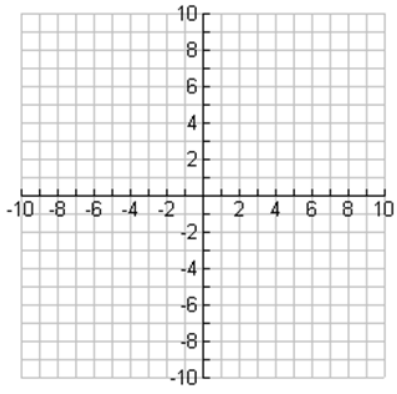
Domain: _____ Range: _____

Asymptote: _____ Inc or Dec

X-Int: _____ Y-Int: _____

End Behavior: $x \to$ _____, $f(x) \to$ _____

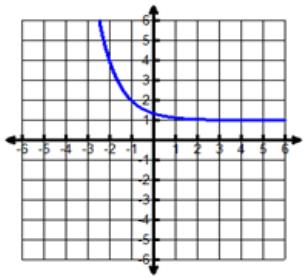
$x \to$ _____, $f(x) \to$ _____



5. A) Does the table or graph have a larger y-intercept?

B) Determine which is a growth problem and which is a decay problem.

X	F(x)
-2	2.125
-1	2.25
0	2.5
1	3
2	4
3	6



6. A) What is type of asymptote (vertical or horizontal) does this table have?

B) What is the equation of the asymptote?

C) Is this an Exponential Function or a Logarithmic Function?

X	F(x)
-0.5	-0.631
0	0
2	1
8	2

7. A) What is type of asymptote (vertical or horizontal) does this table have?

B) What is the equation of the asymptote?

C) Is this an Exponential Function or Logarithmic Function?

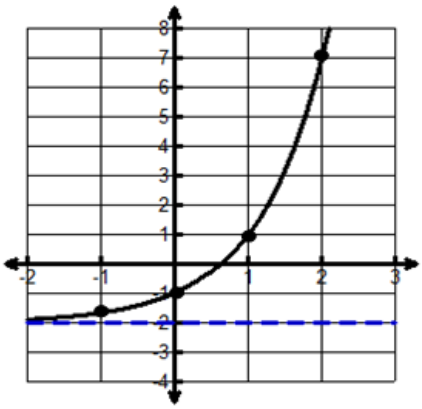
X	F(x)
-1	.111
-0.5	.193
0	.333
1	1
2	3
3	9
4	27

8. Which table is a log function and which table is an exponential function?

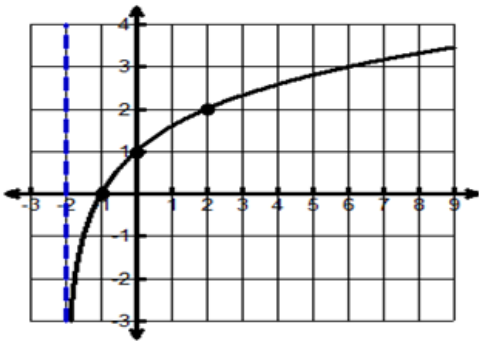
X	F(x)
-0.5	-0.5
0	0
1	.5
3	1
7	1.5
15	2

X	F(x)
-0.5	2
0	4
1	16
2	64
3	256

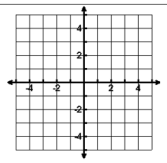
9. Write the equation of the exponential based upon the graph



10. Write the equation of the logarithm based upon the graph



5. $y = \log_2(x-2)$



Transformations_____

State 3 points on Graph_____

Domain_____ Range_____

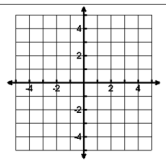
Asymptote_____

X-intercept _____ Y-intercept _____

Increasing or Decreasing

End Behavior $x \to$ ____, $f(x) \to$ ____
$x \to$ ____, $f(x) \to$ ____

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



Transformations_____

State 3 points on Graph_____

Domain_____ Range_____

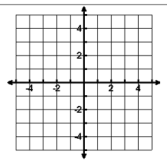
Asymptote_____

X-intercept _____ Y-intercept _____

Increasing or Decreasing

End Behavior $x \to$ ____, $f(x) \to$ ____
$x \to$ ____, $f(x) \to$ ____

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



Transformations_____

State 3 points on Graph_____

Domain_____ Range_____

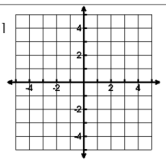
Asymptote_____

X-intercept _____ Y-intercept _____

Increasing or Decreasing

End Behavior $x \to$ ____, $f(x) \to$ ____
$x \to$ ____, $f(x) \to$ ____

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



Transformations_____

State 3 points on Graph_____

Domain_____ Range_____

Asymptote_____

X-intercept _____ Y-intercept _____

Increasing or Decreasing

End Behavior $x \to$ ____, $f(x) \to$ ____
$x \to$ ____, $f(x) \to$ ____