Name: _____ Date: _____ Block: _____

Class Examples: Logarithmic Functions **Honors PreCalculus**

Express the following logarithms in exponential form.

1. $\log_4 1024 = 5$
   $4^5 = 1024$

2. $\log_{10} 0.1 = -1$
   $10^{-1} = 0.1$

3. $\log_{36} \frac{1}{6} = -\frac{1}{2}$
   $36^{-\frac{1}{2}} = \frac{1}{6}$

4. $\log_8 512 = 3$
   $8^3 = 512$

5. $\log_{12} 144 = 2$
   $12^2 = 144$

6. $\log_8 4096 = 4$
   $8^4 = 4096$

Express the following exponential equations in logarithmic form.

7. $2^6 = 64$
   $\log_2 64 = 6$

8. $12^{\frac{3}{2}} = 64$
   $\log_{12} 64 = \frac{3}{2}$

9. $49^{-\frac{1}{2}} = \frac{1}{7}$
   $\log_{49} \frac{1}{7} = -\frac{1}{2}$

10. $2^0 = 1$
    $\log_2 1 = 0$

11. $12^2 = 144$
    $\log_{12} 144 = 2$

12. $5^{-2} = \frac{1}{25}$
    $\log_5 \frac{1}{25} = -2$

Evaluate each logarithm.

13. $\log_8 64 = x$
    $8^x = 64$
    $x = 2$

14. $5^{\log_5 12} = x$
    $\log_5 x = \log_5 12$
    $x = 12$

15. $\log_3 \left(\frac{1}{27}\right) = x$
    $3^x = \frac{1}{27}$
    $x = -3$

16. $\log_{25} \sqrt{5} = x$
    $25^x = \sqrt{5}$
    $(5^2)^x = 5^{\frac{1}{2}}$ $x = \frac{1}{4}$
    $5^{2x} = 5^{\frac{1}{2}}$

17. $\log_2 0.125 = x$
    $2^x = 0.125$
    $2^x = \frac{1}{8}$
    $x = -3$

18. $\log_9 \frac{1}{3} = x$
    $9^x = \frac{1}{3}$
    $x = -\frac{1}{2}$

19. $\log_{10} \sqrt{10} = x$
    $10^x = \sqrt{10}$
    $x = \frac{1}{2}$

20. $\log_{\frac{1}{4}} 4 = x$
    $\left(\frac{1}{4}\right)^x = 4$
    $x = -1$

21. $\log_6 1 = x$
    $6^x = 1$
    $x = 0$

Graph the following on the coordinate plane provided. Identify the domain, range, and vertical asymptote.

22. $f(x) = \log_2 x$

$x = \log_2 y$

$y = 2^x$

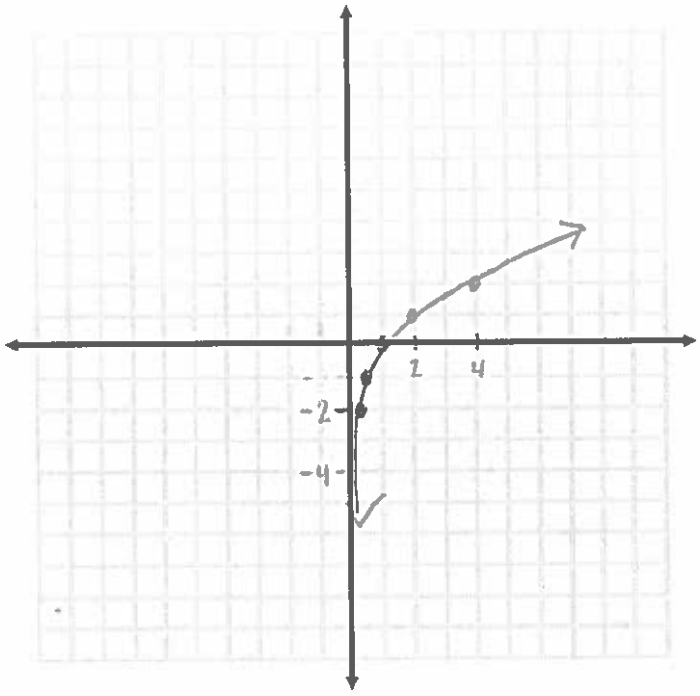
VA: $x = 0$

D: $(0, \infty)$

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

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



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

switch x and y

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

convert to exp. form

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

left 2

VA: $x = 2$

D: $(2, \infty)$

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

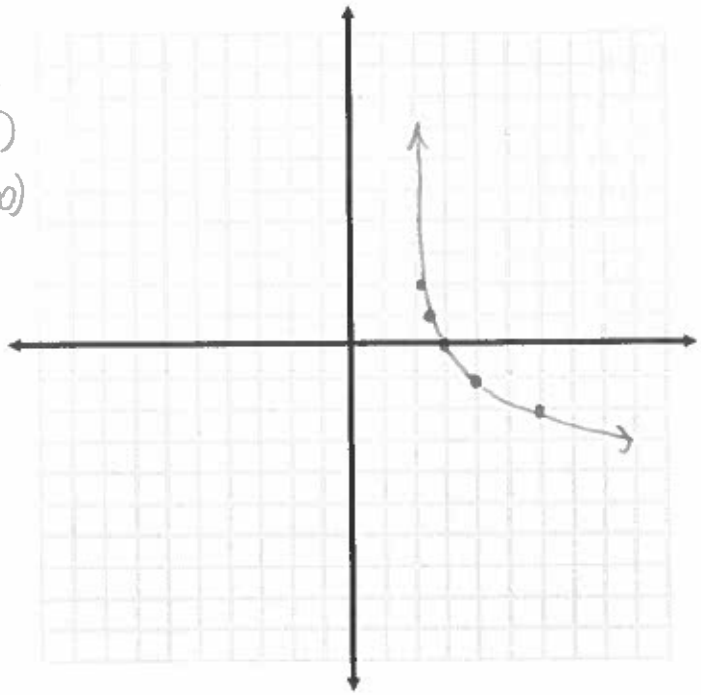
x	y
-2	4
-1	2
0	1
1	1/2
2	1/4

switch x and y back

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

x+2

x	y
6	-2
4	-1
3	0
2 1/2	1
2 1/4	2



Find the domain of the following logarithmic equations.

24. $f(x) = \log_8(2x - 3)$

$2x-3>0$

$x>3/2$

$(\frac{3}{2}, \infty)$

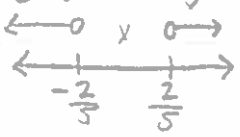
25. $f(x) = \log_2(-4 + 25x^2)$

$-4+25x^2>0$

$25x^2-4>0$

$(5x-2)(5x+2)>0$ ✓

$x=2/5, -2/5$



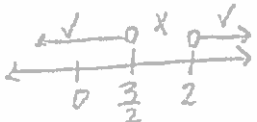
$(-\infty, -\frac{2}{5}) \cup (\frac{2}{5}, \infty)$

26. $f(x) = \log_3(2x^2 - 7x + 6)$

$2x^2-7x+6>0$

$(2x-3)(x-2)>0$

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



$(-\infty, \frac{3}{2}) \cup (2, \infty)$

Partner Activity:

1. The number of miles s of roads cleared of snow is approximated by the model $s = 25 - \frac{13\ln(\frac{h}{12})}{\ln 3}$, $2 \le h \le 15$ where h is the depth of the snow in inches. Use this model to find s when h=*10 inches.*

$S = 25 - \frac{13\ln(\frac{10}{12})}{\ln 3}$

$= 27.157$ miles

2. Use your graphing calculator to solve the following equation. $\log(-x - 4) = 2$

use the table to find where they intersect.

$(-104, 2)$

$10^2 = -x-4$

$100 = -x-4$

$104 = -x$

$-104 = x$