Name:________________________________ Date:______________________

Math 12 Honors Section 5.8 Graphing Challenging Logarithmic Functions:

1. If the value of the base becomes a variable "x", then how would it affect your logarithmic function? Explain: ie: $y = \log(2x+1) \rightarrow y = \log_x(2x+1)$

2. Suppose "a", "b", "c" and "d" are all positive values, indicate how you would find all the vertical asymptotes? $y = \log_{ax+b}(cx+d)$ Explain:

3. Suppose "a", "b", "c" and "d" are all positive values, indicate how you would find all the vertical asymptotes? $y = \log_{ax+b}(cx^2-d)$ Explain:

4. What is the domain and range of the function: $y = \log_{x^2}(x-6)-1$. What are the "x" and "y" intercepts?

5. Describe the graph of $y = \log_{x+3}(2x+6)+17$.

6. What is the difference between the two graphs? How are the domain and range different? Explain: $y = \log_x(3x+1)$ vs $y = \log_x(3x-1)$

7. What are the asymptotes of the equation: $y = \log_x(x^2+9)$. Explain:

8. Indicate the equations of the asymptotes, domain and range, and also the value of "y" as "x" goes to extreme values:

a) $y = \log\left(4x^2 - 25\right)$ Asymptotes: Domain & Range: Extreme Values:	b) $y = \log\left(3x^2 - 16\right) + 1$ Asymptotes: Domain & Range: Extreme Values:
c) $y = \log\left(2x^2 + 25\right) - 4$ Asymptotes: Domain & Range: Extreme Values:	d) $y = \log\left[x^3 - x^2\right] - 2$ Asymptotes: Domain & Range: Extreme Values:
e) $y = 2\log_x\left(5x - 4\right) + 2$ Asymptotes: Domain & Range: Extreme Values:	f) $y = 3\log_x\left(3x + 4\right) + 3$ Asymptotes: Domain & Range: Extreme Values:

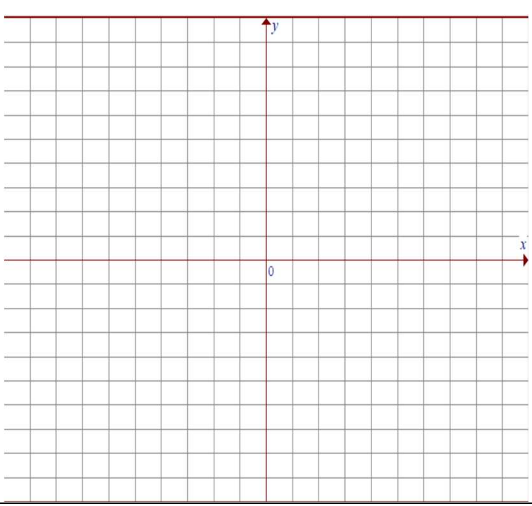
g) $y = 3\log_{x+2}(10-4x)+1$ Asymptotes: Domain & Range: Extreme Values:	h) $y = \log_{x+4}\left(4x^2-25\right)-1$ Asymptotes: Domain & Range: Extreme Values:
i) $y = -2\log_{x+5}\left(x^2+4\right)+3$ Asymptotes: Domain & Range: Extreme Values:	j) $y = \log_{x^2}\left(3x^2-25\right)$ Asymptotes: Domain & Range: Extreme Values:

9. Graph each of the following functions. Indicate the equations of the vertical and horizontal asymptotes. Indicate the domain and range. Find the “x” and “y” intercepts if there are any:

a) $y = \log\left(3x^2-20\right)$

Asymptotes: Domain & Range:

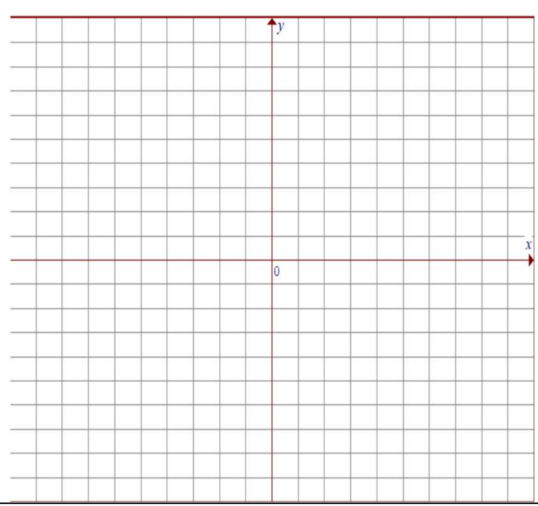
“X” and ‘y’ intercepts



b) $y = \log\left(3x^2-20\right)$

Asymptotes: Domain & Range:

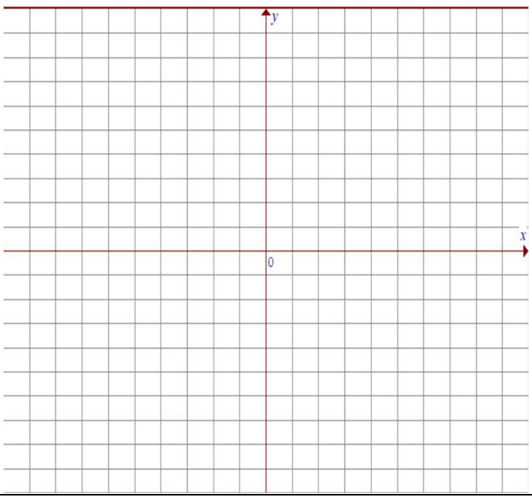
“X” and ‘y’ intercepts



c) $y = \log\left[\left(x^2 - 1\right)\left(x + 2\right)\right]$

Asymptotes: Domain & Range:

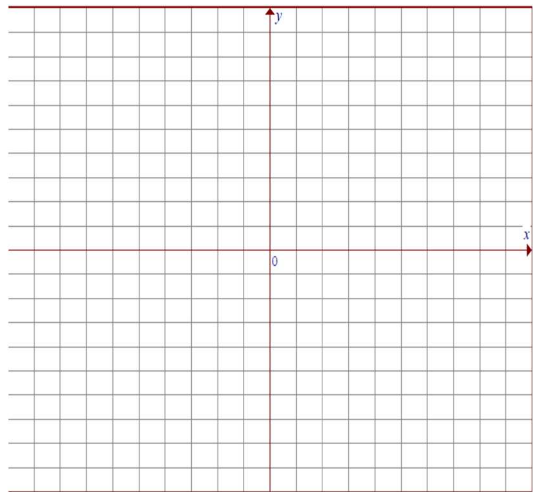
“X” and ‘y’ intercepts



d) $y = \log_x\left(x + 1\right) + 2$

Asymptotes: Domain & Range:

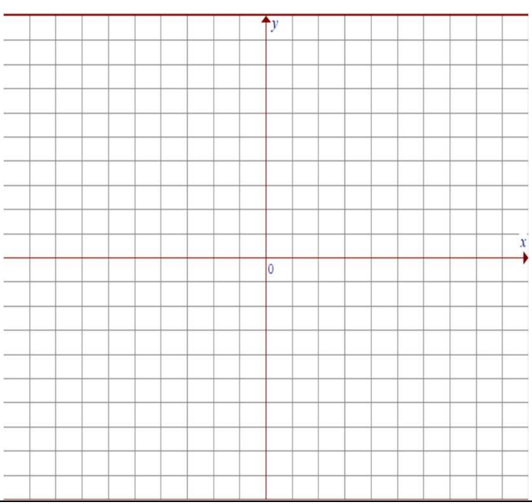
“X” and ‘y’ intercepts



e) $y = \log_x\left(5x + 4\right) - 2$

Asymptotes: Domain & Range:

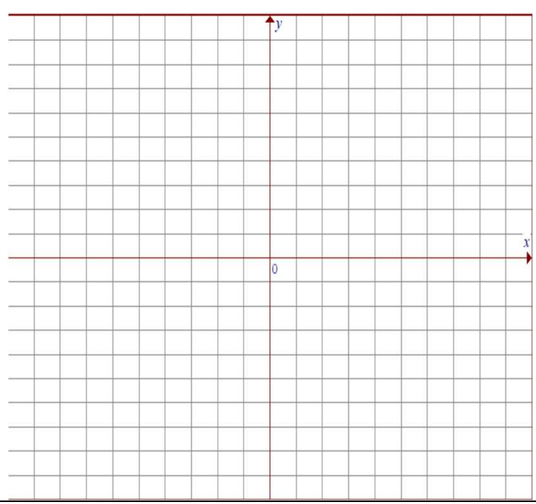
“X” and ‘y’ intercepts



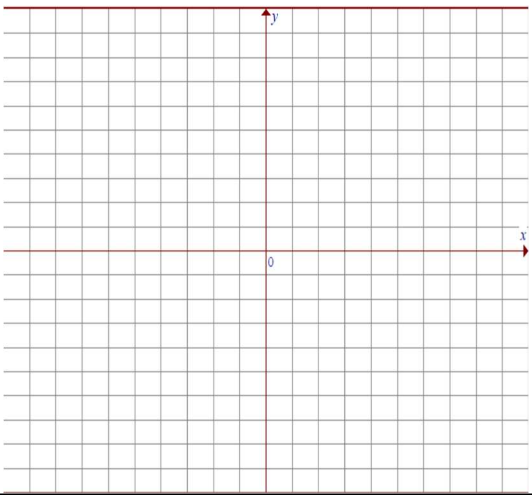
f) $y = \log_x\left(8 - 5x\right) + 1$

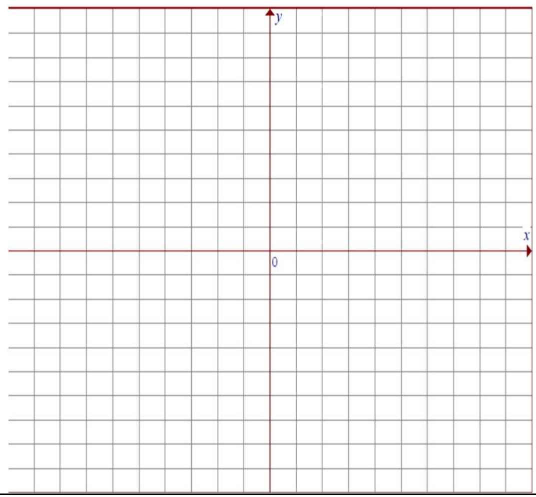
Asymptotes: Domain & Range:

“X” and ‘y’ intercepts



<table>
<tr>
<td>g) $y = \log_{x+1}\left(x^2 - 49\right)$
Asymptotes: Domain & Range:

“X” and ‘y’ intercepts

</td>
<td>h) $y = \log_{x+7}\left(3x^2 - 64\right)$
Asymptotes: Domain & Range:

“X” and ‘y’ intercepts

</td>
</tr>
</table>

What are all real numbers $x > 0$ for which $\log_2(x^2) + 2\log_x 8 = \dfrac{392}{\log_2(x^3) + 20\log_x(32)}$?

There is a unique positive real number x such that the three numbers $\log_8(2x)$, $\log_4 x$, and $\log_2 x$, in that order, form a geometric progression with positive common ratio. The number x can be written as $\frac{m}{n}$, where m and n are relatively prime positive integers. Find $m + n$.

The value of x that satisfies $\log_{2^x} 3^{20} = \log_{2^{x+3}} 3^{2020}$ can be written as $\dfrac{m}{n}$, where m and n are relatively prime positive integers. Find $m + n$.

There is a positive real number x not equal to either $\frac{1}{20}$ or $\frac{1}{2}$ such that

$$\log_{20x}(22x) = \log_{2x}(202x).$$

The value $\log_{20x}(22x)$ can be written as $\log_{10}(\frac{m}{n})$, where m and n are relatively prime positive integers. Find $m+n$.

Let x, y, and z be positive real numbers that satisfy

$$2\log_x(2y) = 2\log_{2x}(4z) = \log_{2x^4}(8yz) \neq 0.$$

The value of xy^5z can be expressed in the form $\frac{1}{2^{p/q}}$, where p and q are relatively prime positive integers. Find $p+q$.

In an isosceles trapezoid, the parallel bases have lengths $\log 3$ and $\log 192$, and the altitude to these bases has length $\log 16$. The perimeter of the trapezoid can be written in the form $\log 2^p 3^q$, where p and q are positive integers. Find $p+q$.

s

Let x, y, and z be real numbers satisfying the system

$$\log_2(xyz - 3 + \log_5 x) = 5,$$
$$\log_3(xyz - 3 + \log_5 y) = 4,$$
$$\log_4(xyz - 3 + \log_5 z) = 4.$$

Find the value of $|\log_5 x| + |\log_5 y| + |\log_5 z|$.