

Please work together, however students must hand in their own lab. **Remember to show any work, NEATLY, and in PENCIL, please ☺, so to that end you may want to do your scratch work on a separate paper, transfer neat work to this, and staple your scratch to this. Make sure you number your scratch problems. Points are deducted for illegible work. (100 pts)**

1. Use the properties of logarithms (no calculator) to evaluate the following expressions. Show any work and appropriate use of the equal sign: (25 pts)

a. $\log_8 8^{17}$

d. $e^{\ln \pi}$

b. $\log_2 64$

e. $\log_8 1$

c. $\log \sqrt{10}$

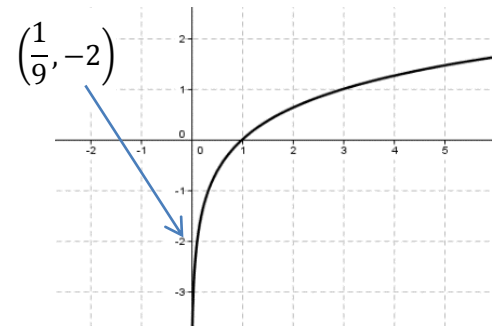
2. Use the definition of the logarithmic function to find x. (10 pts)

a. $\log_5 x = 2$

b. $\log_x 9 = \frac{1}{2}$

3. To the right is the graph of a function of the form $f(x) = \log_a x$. (20 points)

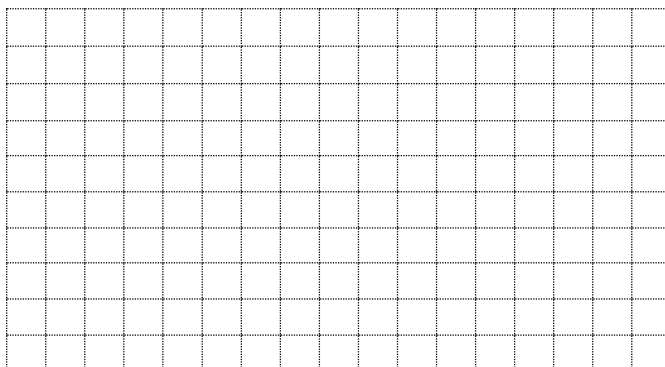
a. Find the function. **Show your work!**



b. What is the asymptote of this function?

c. What is the domain and range of this function?

d. Using transformations, take the graph of $f(x)$ and sketch the graph a new function $g(x) = 2 + f(x - 1)$ Hint: be sure to show where $(1,0)$ & the asymptote have moved and carefully draw in the axes and units as well.



4. Evaluate the expressions using the Laws and Properties of Logarithms. Show your work and appropriate use of the equal sign: (15 points)

a. $\log 4 + \log 25$

b. $\log_2 8^{33}$

c. $\ln(\ln e^{400})$

5. Expand the following expressions using the Laws of Logarithms. Show your work and appropriate use of the equal sign: (10 points)

a. $\log\left(\frac{a^2}{b^4\sqrt{c+2}}\right)$

b. $\ln\sqrt[3]{3r^2s}$

6. Combine the following expressions using the Laws of Logarithms. Show your work and appropriate use of the equal sign: (15 points)

a. $2\log C + \log A - \log(B + 3)$

b. $2(\log_5 x + 3\log_5 y)$

c. $\frac{1}{3}\log(x + 2)^3 + \log x^4 - \frac{1}{2}\log(x^2 - x - 6)^2$

7. Use the Change of Base formula and your calculator to evaluate $\log_3 23$. Show your use of the formula and round to 3 decimal places: (5 points)