Review §§3.1 – 3.4 Player A **Name** _____

3.1 – Exponential and Logistic Functions

1. Determine whether each statement is always (A), sometimes (S), or never (N) true for exponential function $f(x) = a \cdot b^x$.

   a) $\lim_{x \to -\infty} f(x) = 0$. _____

   b) $f(x)$ is an odd function. _____

   c) The graph of $f(x)$ passes through the point (0, b). _____

   d) $f(x)$ is bounded above if a < 0. _____

   e) The graph of $f(x)$ has a vertical asymptote. _____

2. Determine whether each statement is always (A), sometimes (S) or never (N) true for logistic function $g(x) = \dfrac{c}{1 + a \cdot b^x}$.

   a) $\lim_{x \to -\infty} g(x) = 0$ _____

   b) The initial value of $g(x)$ is greater than 1. _____

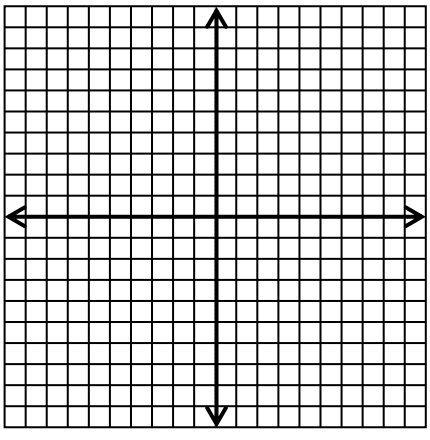
   c) The graph of $g(x)$ is strictly increasing. _____

   d) The domain of $g(x)$ is all positive real numbers. _____

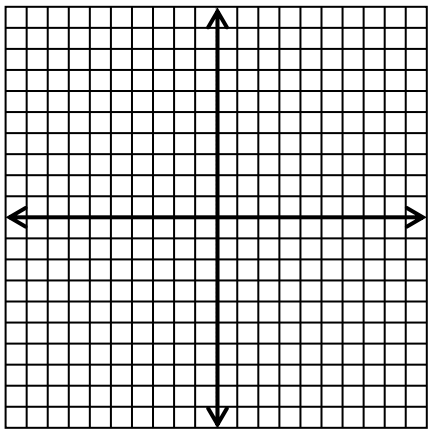
   e) $g(x)$ has a vertical asymptote. _____

3. Sketch a graph of each function:

   a) $f(x) = 4(2)^x$



   b) $f(x) = \dfrac{9}{1 + 2\left(\frac{1}{2}\right)^x}$



3.2 – Exponential and Logistic Modeling

4. Write an exponential function that satisfies the following conditions (make sure to define your variables!): Initial population = 23,000, population doubles every 9 years.

5. Write a logistic function to model a population with an initial value of 3, a limit to growth of 51, and which passes through the point (3, 17).

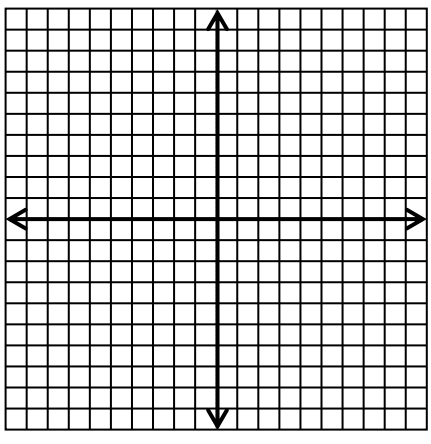
6. (calculator allowed) The population of a bee colony is currently 520, and is increasing at a rate of 2.3% per year.

   a) Write an equation to model the bee population B after t years.

   b) How many years will it take until the bee population reaches 2000 bees? Round your answer to the nearest hundredth of a year.

3.3 – Logarithmic Functions and their Graphs

7. Sketch a graph of the function $g(x) = \log_2(-x)$:



8. What transformations are required to transform the function $f(x)=\log x$ into the function $g(x)=\log_{15}(x+7)$?

9. Simplify:

a) $\log_3\left(\frac{1}{81}\right)$ b) $\ln\left(\sqrt[3]{\frac{1}{e^7}}\right)$

3.4 – Properties of Logarithmic Functions

10. (calculator allowed) Evaluate $\log_5 19$. Round your answer to the nearest thousandth.

11. (calculator allowed) Solve $e^{x+4}=253$ for x. Round your answer to the nearest thousandth.

12. (calculator allowed) Solve $\log_6(x+7)=3.54$ for x. Round your answer to the nearest thousandth.

13. Evaluate $4\log_6 3+\log_6 16$