Please note that the sample test below is not simply a different version of the actual test. You will be given totally new problems. Its only purpose is to give you an idea of the degree of difficulty and the format of the test.

Math 105 Sample Test 4

Dr. Ahlbrandt

100 points total

Your Name

**Part A. Do not use a calculator on this portion. Turn it in before you start part B.** Show all your work for full credit. Solve the problems by solving the equations and show all the steps to complete the problem. No points will be given for just the answers. The points for each problem are given in brackets. Good luck!

1. [4] Simplify \( \log(x^2 + 3x + 2) - \log(x + 1) \)

2. [4] Simplify \( \ln(e^{12}) \)

3. [4] Between what two nearest whole numbers is \( \log_3(35) \)? Explain your reasoning.

4. [4] Find \( \log_5\left(\frac{1}{125}\right) \)

5. [10] Solve for \( x \)
   \[ e^x - 3e^{-x} = 2 \]

6. [7 each] Find an equation for \( f(x) \) for each graph. It is obtained from one of the basic functions by translations and reflections. Asymptotes are dashed.
   a. 
   b. 

   ![Graph a](image1.png)
   ![Graph b](image2.png)
7. [7] Solve for \( x \)
\[
\log(3x+4) = 2
\]

8. [7] Sketch the graph for \( y = \log(x-2) \). Make sure to include all asymptotes as dashed lines.

9. [8] Only set up equation(s) to solve the following problem. Do NOT solve the problem any further to find value(s) for your variable(s). Make sure you declare your variable(s).

A motorboat took 2 hours to make a downstream trip with a 3 mph current. The return trip against the same current took 5 hours. Find the speed of the boat in still water.

10. [8] Describe what happens to the graph of the function \( y = x^2 + k \) as \( k \) increases from 1 to 5. Use a sketch to illustrate your explanations.
1. [8] What is the effective interest rate for an investment plan, which offers 7.8% interest compounded monthly?

2. [8] $2,500 were invested for 5 years at 6% interest compounded quarterly. Find the total interest earned during the 5 years and express the amount as percentage of the original investment.

3. [8] How much money needs to be invested to obtain a balance of $50,000 after 8 years when interest is compounded continuously at a rate of 7.5%?