College Algebra — Exam 4
MAT 140C, Fall 2023 — D. Ivanšić

Name: _____

Show all your work!

1. (8pts) Evaluate without using the calculator. For each problem, write the question you should ask yourself in order to find the logarithms.

$\log_4 64 =$ $\log_5 \frac{1}{25} =$ $\log_a \sqrt[4]{a^7} =$ $\log_{a^2} a^8 =$

2. (4pts) Use the change-of-base formula and your calculator to find $\log_{19} 89$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 4 = 1.262$ and $\log_a 7 = 1.771$, calculate the following values:

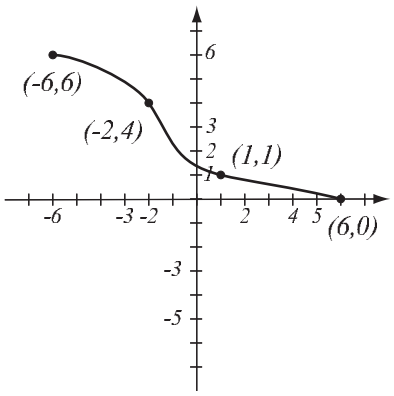
$\log_a 28 =$ $\log_a \frac{4}{49} =$

4. (4pts) Simplify.

$\log 10^{x-1} =$ $9^{\log_9 8080} =$

5. (8pts) If you deposit \$3,000 in an account bearing 4.5% interest, compounded monthly, how much is in the account after 2 years?

6. (6pts) The graph of a function f is given.
a) Is this function one-to-one? Justify.
b) If the function is one-to-one, find the graph of f^{-1}, labeling the relevant points, and showing any asymptotes.



7. (9pts) Let $f(x) = \dfrac{3x}{x-1}$.
a) Find the formula for f^{-1}.
b) Find the range of f^{-1}.

8. (6pts) Using transformations, draw the graph of $f(x) = e^{-x} - 2$. Explain how you transform the graph of a basic function in order to get the graph of f. Indicate at least one point on the graph and any asymptotes.

9. (12pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$\log\left(100x^5\sqrt[3]{y}\right) =$

$\log_2 \dfrac{x^3y^2}{8x^5} =$

10. (12pts) Write as a single logarithm. Simplify if possible.

$2\log(u^3v^{-2}) + 4\log(u^2v^3) =$

$4\log_2(x+4) - 2\log_2(x-4) - 2\log_2(x^2-16) =$

Solve the equations.

11. (6pts) $8^{x-3} = 2^{3-x}$

12. (8pts) $3^{2x+1} = 5^{3x}$

13. (12pts) According to census data, the population of McCracken County, KY, was 65,500 in 2000 and 67,900 in 2020. Assume that it has grown according to the formula $P(t) = P_0 e^{kt}$.
a) Find k and write the function that describes the population at time t years since 2000. Graph it on paper.
b) Find the predicted population in the year 2040.

Bonus (10pts) Solve the equation.

$\log_4(x+1) + \log_4(x+7) = 2$