College Algebra — Exam 4
MAT 140C, Fall 2024 — 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.

$\log_4 64 =$ $\log_2 \frac{1}{8} =$ $\log_a \sqrt[7]{a^6} =$ $\log_{a^2} a^8 =$

2. (4pts) Use the change-of-base formula and your calculator to find $\log_{12} 6$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 3 = 0.6826$ and $\log_a 7 = 1.2091$, calculate the following values:

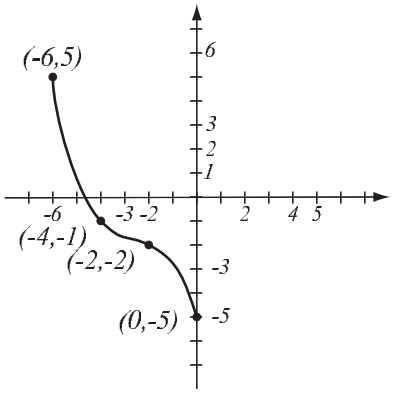
$\log_a \frac{7}{3} =$ $\log_a 63 =$

4. (4pts) Simplify.

$\log 10^{|x|} =$ $6^{\log_6(x^2-7)} =$

5. (8pts) If you deposit \$2,000 in an account bearing 4.2% interest, compounded monthly, how much is in the account after 3 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 $f(x) = \dfrac{2x+3}{x}$.
a) Find the formula for f^{-1}.
b) Find the range of f^{-1}.

8. (6pts) Using transformations, draw the graph of $f(x) = -\log_2(x+3)$. 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.

$\log_3 \left(81x^5 \sqrt[3]{y^4}\right) =$

$\ln \dfrac{x^2y^4}{e^4 x^{\frac{3}{2}}} =$

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

$3\log(a^4b^2) + 2\log(a^3b^{-3}) =$

$3\log_7(3x^2y^4) + 4\log_7\sqrt{y} - 2\log_7(6x^{-2}y^5) =$

Solve the equations.

11. (6pts) $3^{4x-2} = \left(\dfrac{1}{9}\right)^{x-3}$

12. (8pts) $e^{2x-3} = 5^{4x-7}$

13. (12pts) Census data has the population of Elizabethtown, KY, as 28,500 in 2010 and 31,400 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 2010. Graph it on paper.
b) Find the predicted population in the year 2028.

Bonus (10pts) Solve the equation.

$\log_2(x-3) + \log_2(x+1) = 5$