College Algebra — Exam 4
MAT 140, Fall 2020 — D. Ivanšić

Name: _____

Show all your work!

1. (8pts) Evaluate without using the calculator:

$\log_4 64 =$ $\log_3 \frac{1}{27} =$ $\log_a \sqrt[5]{a^9} =$ $\log_{b^8} b^2 =$

2. (4pts) Use the change-of-base formula and your calculator to find $\log_7 66$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 3 = u$ and $\log_a 7 = v$, express in terms of u and v:

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

4. (6pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$\log_4 \frac{16x^3}{\sqrt[4]{y^9}} =$

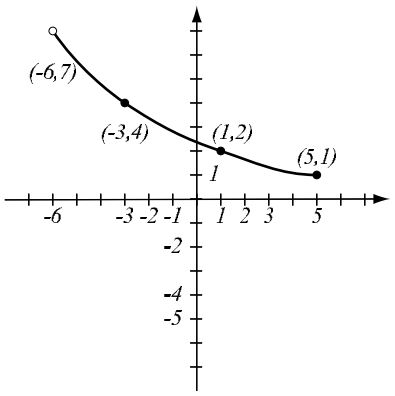
5. (6pts) Write as a single logarithm. Simplify if possible.

$4\ln(x^4y^{-3}) - 3\ln(x^4y^6) =$

6. (4pts) Simplify.

$\log 10^{3x-4} =$ $5^{\log_5 13} =$

7. (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.



8. (9pts) Let $f(x) = \dfrac{2x-1}{x}$.
a) Find the formula for f^{-1}.
b) Find the range of f.

9. (6pts) Using transformations, draw the graph of $f(x) = 3 - e^x$. 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.

10. (3pts) Find the domain of the function $f(x) = \log(-3x + 2)$ and write it in interval notation.

11. (9pts) \$2500 is deposited in an account bearing 2.34% interest, compounded monthly. How much is in the account after 10 years?

Solve the equations.

12. (6pts) $2^{5x+2} = \left(\frac{1}{8}\right)^{x-1}$

13. (8pts) $3^{2x-3} = 5^{x+4}$

14. (8pts) $\log_2(x + 2) + \log_2(x - 4) = 4$

15. (12pts) The population of Maricopa county, Arizona, was 3,072,000 in 2000 and 3,187,000 in 2010. 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 2020.

Bonus (10pts) Let $f(x) = x^2 - 6x + 15$ for $x \leq 3$.
a) Find the formula for f^{-1}. Completing the square may help, but it can be done in another way, too.
b) Find the range of f.