College Algebra — Exam 4
MAT 140, Spring 2018 — D. Ivanšić

Name: _____

Show all your work!

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

$\log_3 81 =$ $\log_2 \frac{1}{16} =$ $\log_a \sqrt{a^7} =$ $\log_{b^3} b^{12} =$

2. (4pts) Use the change-of-base formula and your calculator to find $\log_7 0.56$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 5 = u$ and $\log_a 4 = v$, express in terms of u and v:

$\log_a 20 =$ $\log_a \dfrac{5}{16} =$

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

$\log_7 \dfrac{y^4}{49\sqrt[3]{x^4}} =$

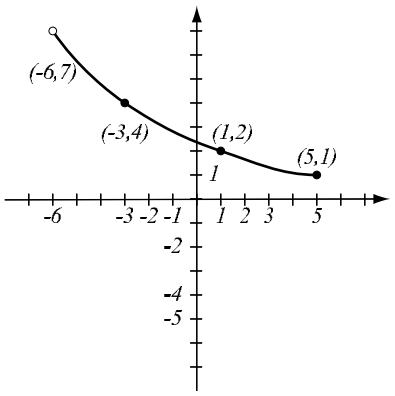
5. (6pts) Write as a single logarithm. Simplify if possible.

$3\log(x^2y^{-3}) - 2\log(x^4y) =$

6. (4pts) Simplify.

$\ln e^{3x-4} =$ $6^{\log_6 \sqrt{2}} =$

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 $f(x) = \dfrac{x-3}{4x}$.
a) Find the formula for f^{-1}.
b) Find the range of f.

9. (6pts) Using transformations, draw the graph of $f(x) = 4 + e^{-x}$. 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 $f(x) = \log_5(4x + 9)$ and write it in interval notation.

11. (9pts) What is better: an account bearing 5.1% compounded monthly, or an account bearing 5.2% compounded quarterly? Find out by comparing \$100 deposits placed for a year.

Solve the equations.

12. (6pts) $2^{2x-1} = 8^{x-3}$

13. (8pts) $5^{x+3} = 9^{2x}$

14. (8pts) $\log_2(2x - 3) - \log_2(x - 7) = 2$

15. (12pts) The population of Breedington was 12,000 in 2011 and 14,000 in 2015. 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 2011. Graph it on paper.
b) Find the predicted population in the year 2020.

Bonus (10pts) Let $f(x) = x^2 - 2x$, with domain $x \geq 1$.
a) Graph the function (sketch on paper!). Explain why it is one-to-one.
b) Find the formula for $f^{-1}(x)$. (Once you set it up, solving for x involves doing a quadratic equation, which you solve using the quadratic formula.)