

College Algebra — Exam 4
MAT 140, Fall 2016 — D. Ivanišić

Name: _____
Show all your work!

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

$$\log_9 729 = \qquad \log_2 \frac{1}{8} = \qquad \log_c \sqrt[7]{c^3} = \qquad \log_{\sqrt{b}} b^4 =$$

2. (4pts) Use the change-of-base formula and your calculator to find $\log_3 0.13$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 5 = u$ and $\log_a 9 = v$, express in terms of u and v :

$$\log_a \frac{9}{5} = \qquad \log_a 15 =$$

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

$$\log_3 \frac{x^4}{9\sqrt{y^7}} =$$

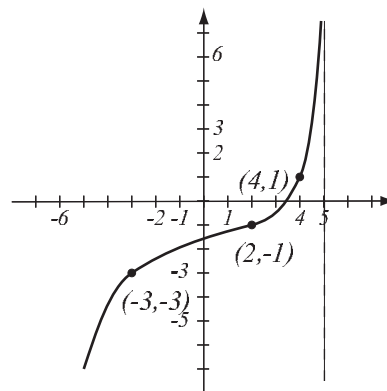
5. (6pts) Write as a single logarithm. Simplify if possible.

$$3\log_2(x^{-2}y^4) - 4\log_2(x^2y^5) =$$

6. (4pts) Simplify.

$$\log 10^{x-3} = \qquad 4^{\log_4(7x)} =$$

7. (6pts) The graph of a function f is given.
- Is this function one-to-one? Justify.
 - If the function is one-to-one, find the graph of f^{-1} , labeling the relevant points, and showing any asymptotes.



8. (9pts) Let $f(x) = \frac{4x - 2}{2x + 3}$.
- Find the formula for f^{-1} .
 - Find the range of f^{-1} .

9. (6pts) Using transformations, draw the graph of $f(x) = 2 - 3^x$. 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. (6pts) Find the domain of the function $f(x) = \frac{\log_3(2x - 7)}{\log_7(5 - x)}$ and write it in interval notation.

11. (8pts) How much should you invest in an account bearing 3.1%, compounded quarterly, if you wish to have \$1,000 in five years?

Solve the equations.

12. (6pts) $16^{3x-2} = \left(\frac{1}{8}\right)^{x+1}$

13. (4pts) $5^{2x} = 4$

14. (10pts) $2^{2x} - 16 = 6 \cdot 2^x$

15. (12pts) The population of Fecund Grove was 14,000 in 2005 and 22,000 in 2011. Assume that it has grown according to the formula $P(t) = P_0e^{kt}$.

a) Find k and write the function that describes the population at time t years since 2005. Graph it on paper.

b) Find the predicted population in the year 2021.

Bonus (10pts) Let $f(x) = \frac{3}{1 + e^{-x}}$.

a) Find the inverse function of f .

b) Show that $f^{-1}(f(x)) = x$.