

College Algebra — Exam 4  
MAT 140, Spring 2016 — D. Ivanšić

Name: \_\_\_\_\_  
*Show all your work!*

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

$$\log_8 64 = \quad \log_3 \frac{1}{81} = \quad \log_a \sqrt[5]{a^2} = \quad \log_{b^4} \sqrt{b} =$$

2. (4pts) Use the change-of-base formula and your calculator to find  $\log_5 6$  with accuracy 6 decimal places. Show how you obtained your number.

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

$$\log_a 21 = \quad \log_a \frac{27}{49} =$$

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

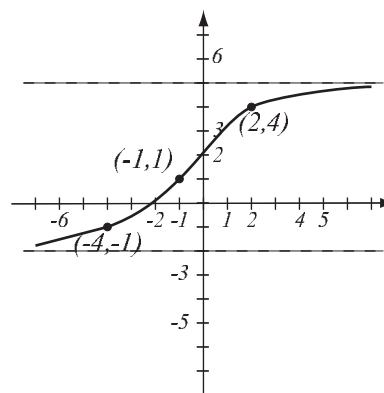
$$\ln \frac{e^2 x^3}{\sqrt[3]{y^5}} =$$

5. (12pts) Write as a single logarithm. Simplify if possible.

$$2 \log_4(x^2 y^{-4}) + 3 \log_4(x^{-2} y^3) =$$

$$3 \log(x + 7) - 4 \log(x^2 + 4x - 21) + 5 \log(x - 3) =$$

6. (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.



7. (9pts) Let  $f(x) = \frac{3-x}{x+2}$ .
- Find the formula for  $f^{-1}$ .
  - Find the range of  $f$ .

8. (6pts) Using transformations, draw the graph of  $f(x) = e^{x+3} - 4$ . 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. (6pts) Find the domain of the function  $f(x) = \frac{\log_6(4x - 15)}{x - 4}$  and write it in interval notation.

10. (8pts) How much should you invest in an account bearing 3.66%, compounded monthly, if you wish to have \$3,000 in five years?

Solve the equations.

11. (8pts)  $7^{2x-1} = 5^{x+2}$

12. (10pts)  $3^{2x} - 6 \cdot 3^x = 18$

**13.** (12pts) The population of Spiriton was 95,000 in 2000 and 126,000 in 2010. 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 2000. Graph it on paper.

b) Find the predicted population in the year 2021.

**Bonus** (10pts) What is better: depositing money into an account with interest rate 4.5%, compounded quarterly, or into an account with interest rate 4.4%, compounded monthly? (To determine this, calculate the amount at the end of 1 year, if \$100 is deposited into either account.)