

College Algebra — Exam 4
MAT 140, Fall 2012 — D. Ivanišić

Name: _____
Show all your work!

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

$$\log_9 81 = \qquad \log_{49} \frac{1}{7} = \qquad \log_a \sqrt[3]{a^4} = \qquad \log_{16} 64 = \qquad \text{(think root)}$$

2. (4pts) Use your calculator to find $\log_4 65$ with accuracy 6 decimal places. Show how you obtained your number.

3. (5pts) If $\log_a 7 = 1.180299$ and $\log_a 2 = 0.420431$, find (show how you obtained your numbers):

$$\log_a \frac{7}{2} = \qquad \log_a 56 =$$

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

$$\log_3 \frac{x^4}{9^4 \sqrt{y^5}} =$$

5. (13pts) Write as a single logarithm. Simplify if possible.

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

$$2 \log_7(x^2 + 2x - 15) + \log_7(x + 5) - 3 \log_7(x - 3) =$$

6. (8pts) How much should you invest in an account bearing 3.32%, compounded monthly, if you wish to have \$9,000 in three years?

7. (9pts) Let $f(x) = b^x$, $b > 1$.

a) Draw the graph of the exponential function. Indicate three points on this graph.

b) Use the graph of f to draw the graph of its inverse $f^{-1}(x) = \log_b x$. Indicate three points on this graph.

c) What is the range of $f^{-1}(x)$?

8. (8pts) Let $f(x) = 2 \log_3(x - 4)$.

a) What is the domain of f ?

b) Explain how you transform the graph of $\log_3 x$ in order to get the graph of f . Indicate the x -intercept and any asymptotes.

- 9.** (9pts) Let $f(x) = \frac{2x}{x-3}$, $x \geq 0$.
- a) Find the formula for f^{-1} .
 - b) Find the range of f .

Solve the equations.

10. (8pts) $\left(\frac{1}{6}\right)^{3x-1} = 36^{3-5x}$

11. (10pts) $\log_8(x-2) + \log_8(x+6) = 2\log_8(x+4)$

12. (12pts) In 1994, the population of Chinchilla City was 32,000 and has since then grown according to the formula $P(t) = P_0e^{kt}$, with a 2.5% exponential growth rate.

a) Write the function that describes the population at time t years since 1994. Graph it on paper.

b) Find the population in the year 2005.

c) When will Chinchilla City reach population 50,000?

Bonus (10pts) If you invest in an account bearing 7% interest, compounded weekly, how long will it take until your money doubles? (*Hint: the deposit amount doesn't matter.*)