MAT 111 Exam IV Spring 2003 **Name** _____

Problem	Score
1 (7 pts)	
2 (19 pts)	
3 (11 pts)	
4 (13 pts)	
Total (50 pts)	

Instructions

1. Do all of your work in this booklet. Do not tear off any sheets.
2. **SHOW ALL OF YOUR STEPS** in the problems.
3. Be **clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place a **box** around your answers.
5. Place your name on all of the pages.
6. If you need more space, you may use the back of a page, and write **On back of page __** in the problem space.

Probem 1. **Multiple Guess** (7 pts) In this section, find the answer which best fits the question and write it in the space provided**.**

a) An equivalent logarithmic form of $4^x = y$ is:
a) $\log_4 x = y$ b) $\log_4 y = x$ c) $\log_x 4 = y$
d) $\log_y 4 = x$ e) none of these ___

b) If $\log_x 81 = 4$ then $x =$
a) 3 b) 4 c) 81^4 d) $\log_4 81$ e) none of these ___

c) $\log \dfrac{x^2 + 2y}{x^2}$ can be written as
a) $2\log x + \log 2y - 2\log x$ b) $\log(x^2 + 2y) - 2\log x$
c) $\log(x^2 + 2y)/\log x^2$ d) $2\log x + \log(x^2 + y)$
e) none of these ___

d) $3\ln 2x - \ln x$ can be written as
a) $5\ln x$ b) $3\ln 2x^2$ c) $\ln(8x^4)$ d) $\ln(8x^2)$
e) none of these ___

e) $\log_3 \sqrt{27}$ is the same as
a) 2 b) 1/2 c) 3/2 d) none of these ___

f) The domain of $\log(x-2)$ is the set of reals such that
a) $x \neq 2$ b) $x \neq -2$ c) $x > 2$ d) $x > -2$
e) none of these ___

g) $\log_5 3$ is the same as
a) $\dfrac{\ln 5}{\ln 3}$ b) $\dfrac{\log_5 3}{\ln 3}$ c) $\dfrac{\log 5}{\log 10}$ d) $\dfrac{\log 3}{\log 5}$
e) none of these. ___

Problem 2. Solutions (19 pts)

a) Do the following:

i. Write as one logarithm: $\frac{1}{2}\log x - 3\log(x-2)$.

ii. Calculate to three places: $\log_4 9$.

iii. Write $\log(a^2\sqrt{b})^4$ in terms of simple logarithms of a, b.

iv. Let $z = 5^{3x}$. Write the simplest equivalent logarithmic expression.

v. Simplify the expression: $\log_2 3 \log_3 4$.

b) Solve exactly when possible:

i. $\ln(7x - 12) = 2\ln x$.

ii. $4^{1-2x} = 2$.

iii. $e^{1-2x} = 4$.

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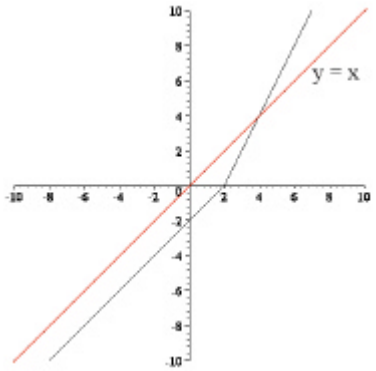
Problem 3. Inverses and Graphs(11 pts)

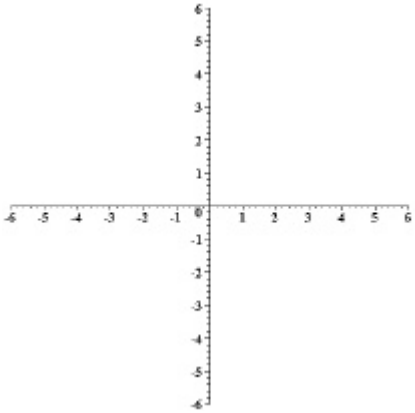
a) Find the inverse of $f(x) = \frac{x}{x+3}$.

b) What are the domains and ranges of $f(x)$ and $f^{-1}(x)$ in part a)?

c) On the graph below is $y = x$ and $y = f(x)$. Plot the inverse $f^{-1}(x)$ on the same graph . Label important information.



d) Sketch the function: $f(x) = \ln(x-2)$ Label any intercepts and asymptotes.



Problem 4. Applications (13 pts)

a) Your parents lend you $5000 at 4% compounded monthly.

i. What is the amount that you owe after three years?

ii. How much would you owe if they continuously compounded the interest for the same time at 4%?

b) A culture of bacteria grows exponentially. If 500 are present initially, and there are 800 after one hour, how many will be present after 5 hours?

c) The data below gives the weight of a radioactive material over several weeks.

Week	Weight (g)
0	100
1	83.3
2	75.9
3	69.4
4	59.1

i. Fit an exponential model to this data and write the function in the form $A = A_0 e^{kt}$.

ii. How much radioactive material will be left after 50 years .