TEST I

Math 232
February 12, 2004

Name: _____

By writing my name I swear by the honor code.

Read all of the following information before starting the exam:

- Show all work, clearly and in order. You will not get full credit if I cannot see how you arrived at your answer (even if your final answer is correct).
- Make sure that you follow the directions in each problem and that your answer matches what is asked for.
- Justify your answers algebraically whenever possible. For most problems, work done by calculator will not receive any points (although you may use your calculator to check your answers).
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- By writing your name above, you agree to the JMU honor code. In particular, this means that you may not use any notes or crib sheets during this exam, that all work must be your own, and that you may not obtain advance information revealing the problems on this exam.
- This test has 8 problems and is worth 100 points, plus some extra credit at the end. Make sure that you have all of the pages!
- Good luck!

1. **(*12 pts*)** Determine whether each of the following statements is true (T) or false (F).

(**a**) **T** **F** The quotient of two algebraic functions is itself an algebraic function.

(**b**) **T** **F** For all $x > 0$, we have $(\log_2 x)^3 = 3 \log_2 x$.

(**c**) **T** **F** For all $b > 0$, $b \neq 1$, $(\log_b 3)(\log_b 4) = \log_b 12$.

(**d**) **T** **F** If $f'(x)$ is proportional to $f(x)$, then $f(x)$ must be an exponential function.

(**e**) **T** **F** The function $f(x) = e^{0.2x}$ dominates the function $g(x) = 3x^7$ as $x \to \infty$.

(**f**) **T** **F** I would like two free points, please.

2. **(*12 pts*)** Give short answers.

(**a**) Why can't we use L'Hôpital's Rule on the limit $\lim_{x \to \infty} \dfrac{e^{-3x}}{e^{4x} - 10}$?

(**b**) State the chain rule, using Leibniz notation.

(**c**) What is the definition of the function $y = \ln x$?

3. (*16 pts*) Calculate $\lim_{x\to\infty} \dfrac{3^x + 1000}{2 - 4^x}$ two ways, as described below. Show all work carefully.

(**a**) Without using L'Hôpital's Rule.

(**b**) Using L'Hôpital's Rule.

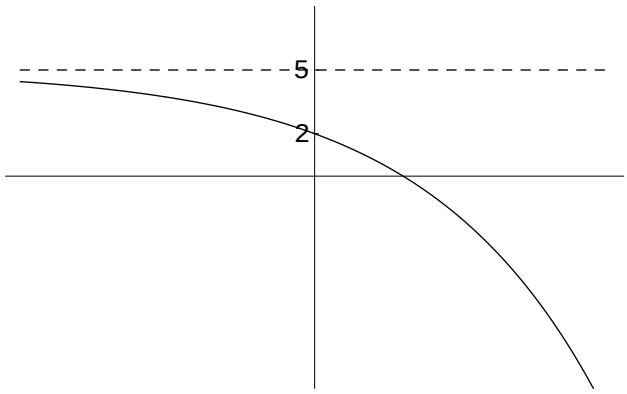
4. (*16 pts*) Calculate the following derivatives. Show any work. You do not have to simplify your answers.

(**a**) If $f(x) = \dfrac{e^{3x^5-7}}{1+x^2}$, find $f'(x)$.

(**b**) If $\sqrt{3y-1} = 5xy$, find $\frac{dy}{dx}$.

5. (*10 pts*) Find the critical points of $f(x) = \sqrt{x}(x-2)$, and then make a number line for f'. Show your work clearly. (You don't have to do anything with the number line, just make it.)

6. (*10 pts*) Find a function that has the graph shown below. Show your work clearly and in order so I can see how you arrived at your answer. Circle your final answer.



7. (*10 pts*) The half-life of a certain radioactive substance in a rock sample is 29 years. By what percentage does the radioactive substance decrease each year? *(Show your work clearly so I can see exactly how you arrived at your answer. Give an EXACT answer, not an approximation.)*

8. (*15 pts*) Algebra! Show all work and circle your final answers.

(**a**) Solve the equation $\log_4 x = -2$.

(**b**) Find the domain of $f(x) = \dfrac{1}{\ln(x-2)}$.

(**c**) Write $f(x) = 3e^{2x+1}$ in the form $f(x) = Ab^x$. Clearly indicate what A and b are in your answer.

Survey Questions: *(2 extra credit points)*

Name a question or topic that could have been on this test, but wasn't.

How do you think you did?

SPACE FOR SCRAP WORK