DEPARTMENT OF MATHEMATICS AND STATISTICS
UNIVERSITY OF MASSACHUSETTS
MATH 131 Spring 2004
EXAM I

Your Section Number: _____

Your Instructor's Name: _____

Print Your Name: _____

Your ID Number: _____

Sign Your Name: _____

This exam consists of 5 questions. It has 6 numbered pages, where the last is a blank page. Each problem is worth the indicated number of points. On this exam, you may use a calculator and a page of your own notes, but no books.

Unless indicated otherwise, it is not sufficient to just write the answers, and you must *show your work* to receive credit for a problem.

Please **circle** or **box** your final answer for each problem.

_____

Leave the space below empty!

           1. (20) _____

           2. (20) _____

           3. (20) _____

           4. (20) _____

           5. (20) _____

        TOTAL (100)

1. Please classify the following statements as *True* or *False*. Write out the word completely; do not simply write T or F. There is no partial credit for this problem, and it is not necessary to show your work for this problem.

   (a) (4 pts) The function $f(x) = \dfrac{x-1}{x-2}$ is not continuous at $x = 2$.

   (b) (4 pts) Suppose $f(1) = 0$, $f'(0) = 1$, $g(0) = 1$, and $g'(0) = 3$. Then the derivative of $f(x)g(x)$ evaluated at $x = 0$ is 1.

   (c) (4 pts) According to the limit laws, $\lim\limits_{x \to a} \dfrac{f(x)}{g(x)} = \dfrac{f(a)}{g(a)}$ as long as $g(a) \neq 0$.

   (d) (4 pts) If $f(x) = e^x$, then the slope of the tangent line to the graph of $f(x)$ at $x = 0$ is 1.

   (e) (4 pts) If $f(x)$ is continuous at $x = 1$, then $f(x)$ is differentiable at $x = 1$.

2. Compute the following limits.

(a) (6 pts) $\displaystyle\lim_{x\to 2}\frac{x^2-4}{x-2}$

(b) (7 pts) $\displaystyle\lim_{x\to 4}\frac{x-4}{\sqrt{x}-2}$

(c) (7 pts) $\displaystyle\lim_{x\to\infty}\frac{3x^2+2x+1}{2x^3-4x^2-1}$

3. Let $f(x)$ be function.

   (a) (4 pts) State the definition of the derivative.

   (b) (8 pts) Use the definition to compute the derivative of $f(x) = x^2 + 1$.

   (c) (8 pts) Use the definition to compute the derivative of $f(x) = \dfrac{1}{x + 3}$.

4. Let $f(x) = \dfrac{x^2 - 4x + 3}{x^2 - 1}$.

   (a) (3 pts) What is the domain of $f(x)$?

   (b) (6 pts) Compute $f'(x)$. (Please do *not* simplify your answer.)

   (c) (5 pts) Find the equation for the tangent line to the graph of $f(x)$ at $x = 0$.

   (d) (6 pts) Find equations for the vertical asymptotes of $f(x)$, if there are any.

5. Let $f(x) = x^3 - 6x^2 + 12x + 2$.

   (a) (5 pts) Compute the derivative of f.

   (b) (15 pts) Find the x-coordinates of all points where the graph of $f(x)$ has a tangent line parallel to the line $y = 3x + 4$.