Mathematics 211, Lecture 2 (Wilson)

Your Name: _____

Circle your TA's name:

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	Exam I 2/	29/96

Write your answers to the seven problems in the spaces provided. If you must continue an answer somewhere other than immediately after the problem statement, be sure (a) to tell where to look for the answer, and (b) to label the answer wherever it winds up. In any case, be sure to circle your final answer to each problem.

You may refer to notes you have brought in on one sheet of paper, as announced in class.

BE SURE TO SHOW YOUR WORK: YOU MAY RECEIVE REDUCED OR ZERO CREDIT FOR UNSUBSTANTIATED ANSWERS.

Problem	Points	Score
1	12	
2	16	
3	15	
4	16	
5	12	
6	14	
7	15	
TOTAL	100	

Problem 1 (12 points)

For each limit shown, tell whether it exists and if so what its value is. (a)

$$\lim_{x \to 2} \frac{x^2 - 5x + 6}{x^2 - x - 2}$$

(b)

$$\lim_{x \to \infty} \frac{3x^3 + 2x^2 + 1}{4x^3 + 2}$$

(c)

$$\lim_{x \to 0} \frac{x^2 + 4x + 1}{3x^2}$$

Problem 2 (16 points)

(a) Use the definition of the derivative as a limit to find f'(x) for

$$f(x) = x^2 + 2x - 1$$

(b) Find an equation for the tangent line to the graph of $y = x^2 + 2x + 1$ at the point (4,25).

Problem 3 (15 points)

The height of a certain object above the ground (in feet at time t in seconds) is given by

 $f(t) = 14t - t^2 + 5$

(a) What is the velocity of this object at time t = 9? Is the object moving up or down at that time?

(b) When is the object at its highest point above the ground?

(c) How high does the object get above the ground?

Problem 4 (16 points)

(a) Find the derivative of:

$$f(x) = \sqrt{2x^3 - 3}$$

(b) Find the derivative of:

$$f(x) = \frac{x^4 + 2x + 2}{\sqrt{3x - 1}}$$

(c) Find the derivative of:

$$f(x) = (2x^3 - 5)^{79}$$

(d) Find the <u>second</u> derivative of:

$$f(x) = (x^2 + 3)^{25}$$

Problem 5 (12 points) Let $f(x) = x^4 + 4x^3 - 48x^2$.

(a) On what intervals is the graph of f concave upward? Concave downward?

(b) Where does f have points of inflection?

Problem 6 (14 points)

- Let $f(x) = 15 + 9x + 3x^2 x^3$.
- (a) On what intervals is f increasing? Decreasing?

(b) What are the critical numbers for f?

Problem 7 (15 points)

Let $f(x) = 2x^3 - 3x^2 - 120x$. Find all relative maxima and relative minima of f. For each point you give as an answer, be sure to tell whether it is a maximum or a minimum, and how you know!