Math 180 F

SECOND HOUR EXAM

NAME____

General Notes:

1. Show work.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam.

Friday, Oct. 26, 2007
100 pts

I. Limits

1. (10 pts.) Give a formal (_ - _) definition of $\lim_{x \to a} f(x) = L$

2. (10 pts.) Show that $\lim_{x \to 1} (3x + 5) = 8$ by finding an appropriate _ for $\varepsilon = \frac{1}{10} (= 10^{-1})$. Be sure to show your work. Just writing down a _ is not sufficient.

3. (10 pts.) Identify x and y intercepts (i.e., points at which the graph crosses the x and y axis) vertical, horizontal, and oblique asymptotes (if any) and give a brief sketch of the following function :

a. $y = \dfrac{x+1}{x-1}$

vertical:

horizontal:

oblique:

Sketch of graph

II. Continuity

1. (5 pts. each).

a. Define (formal definition) what it means for a function **f** to be continuous at a point $\mathbf{x_0}$.

b. What is the intermediate value theorem for continuous functions?

2. (5 pts. each): Identify any points of discontinuity in the following two functions, saying why each is discontinuous at that point.

   a. $\dfrac{x}{x-1}$

   b. $f(x) = \begin{cases} 1 \;\; \textit{if } x > 0 \\ 0 \;\; \textit{if } x = 0 \\ -1 \textit{if } x < 0 \end{cases}$

II. Differentiation

1. (10 pts.) Give a formal definition of the derivative of a function **f(x)** at a point $\mathbf{x_0}$.

2. (10 pts.) **Use the definition** of the derivative to calculate $f'(x) = \frac{d}{dx} f(x)$ for $f(x) = 2x^2 + x + 1$

3. (5 pts each) In the following, calculate the derivative of the given function using the rules for calculating derivatives (i.e., you don't need to use the definition in these problems).

   a. $f(x) = 2x^5 - x^4 + 2x^3 + 5x^2 + 3x - 1$

   b. $f(x) = (2x^3 - 7x)(5x^2 + 4x)$

   c. $f(x) = \dfrac{\sin(x)}{\cos(x)}$

   d. $f(x) = \dfrac{1}{1 + e^x}$

4. (10 pts.) The graph of the curve $y = 2x^2 + x + 7$ passes through the point (1,10). Find the equation of the line tangent to the curve at that point.