Math 180

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, March 5, 2010
100 pts

I. Limits

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

2. (10 pts.) Show that $\lim_{x \to 1} 3x + 7 = 10$ by finding an appropriate δ for a given $\varepsilon = \frac{1}{100} (= 10^{-2})$. Be sure to show your work.

3. (10 pts.) Identify vertical, horizontal, and oblique asymptotes (if any) in the following functions:

a. $y = \dfrac{2x^2}{3x^2 - 1}$

vertical:

horizontal:

oblique:

b. $y = \dfrac{x^3 + 4x^2 + 2x - 1}{x^2 + 2x + 1}$

vertical:

horizontal:

oblique:

II. Continuity

1. (10 pts.). Define (**formal** definition) what it means for a function **f** to be **continuous** at a point $\mathbf{x_0}$.

3. (5 pts. each)

a. The function $f(x) = x^3 - 2$ has a solution f(x)=0 in the interval [1,2]. How do we know this? What theorem of continuity tells us this?

b. Suppose that we use the method of bisection to find a solution for this function f(x)=0. We begin with noting that f(x) has a solution in the interval [1, 2]. What is the next interval we try using the method of bisection?

II. Differentiation

1. (10 pts.) Give a formal definition of the derivative of a function **f(x)**.

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

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

b. $f(x) = (2x^2 - 17)(5x^2 + 1)$

c. $f(x) = \dfrac{(2x^2 - 17)}{(5x^2 + 1)}$

d. $f(x) = \sin(x)\cos(x)$

4. (10 pts.) The graph of the curve $y = x^2 - 1$ passes through the point (2, 3). Find the equation of the line tangent to the curve at that point.