NAME _____ SECTION _____

MIDTERM I

Math 124, Section G

October 25, 2005

Problem	Total Points	Score
1	30	
2	10	
3	20	
4	20	
5	20	
Total	100	
6 (bonus)	2	
7 (bonus)	2	

- No book, notes or graphing calculators are allowed. You may use a scientific calculator.

- Show all your work to get full credit.

- Read instructions for each problem CAREFULLY.

- There are 5 core problems, and 2 bonus problems. You should do bonus problems ONLY if you complete the five core problems ahead of time.

- Test starts on page 3 and ends on page 8. There is a short questionnaire below: please, complete it if you have time left.

- Check your work!

Questionnaire:

(i) Do you find the class to be so far (mark all that apply)

(a) slowly moving

(b) moving at a reasonable pace

(c) fast moving

(d) easy

(e) challenging but doable

(f) difficult

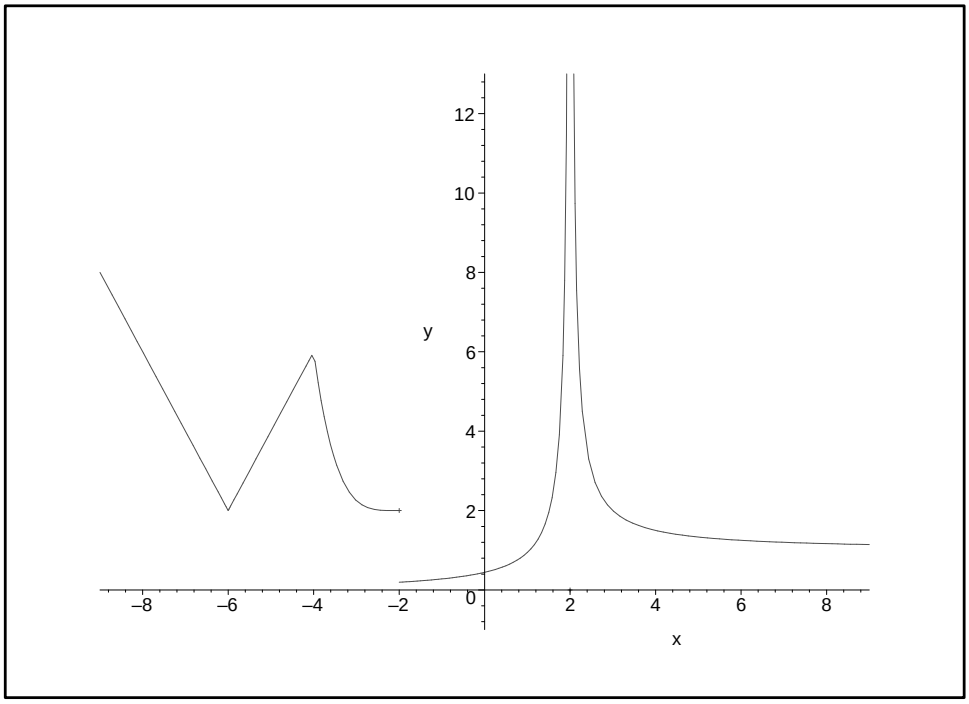
(ii) How many hours a week do you spend on this class OUTSIDE of the classroom

1. (30pts) Compute the following limits:

   (a) $\lim_{x \to -1} \frac{x^2+2x+1}{x+1}$

   (b) $\lim_{x \to 0} \frac{\sin^2 x}{x^2}$

   (c) $\lim_{x \to 0} \frac{x}{\sqrt{1+x}-\sqrt{1-x}}$



2. (10pts) The graph of the function f is given above.

   (a) List all points on the interval $[-7, 7]$ where f is NOT continuous

   (b) List all points on the interval (-7,7) where f is NOT differentiable

3. (20pts) Find the equation of the tangent line to the graph of $f(x) = \sqrt{x+1}$ at the point $x = 3$.

   Note: You must use limits when computing the slope: no credit for using shortcuts from chapter 3 or from your previous experience with calculus.

4. (20pts) Let $f(x) = \frac{x-1}{x}$

(a) Find horizontal asymptotes of $f(x)$ if they exist.

(b) Graph $f(x)$. Label horizontal asymptotes on the graph. (Hint: use that $\frac{x-1}{x} = 1 - \frac{1}{x}$)

(c) What are the domain and range of $f(x)$?

(d) Where is f a continuous function?

(e) Where is f a differentiable function?

(f) Compute $f'(x)$ **using limits**.

(g) Graph $f'(x)$, give the domain and range of $f'(x)$.

5. (20pts) The percentage of the students at the University of Exponential Grade Inflation who get an A for their calculus class is claimed to grow exponentially. In other words, it is modeled by the function

$$f(t) = Ce^{rt}$$

where C, r are positive numbers. If 5% of all students got an A in the year 1970 when the University offered its first calculus course, and reached 20% in 2005, estimate when all students will be getting A for calculus.

Note: You may leave your answer in the exact form.

6. (2) BONUS. Using SQUEEZE THEOREM, show that $\lim_{x\to\infty} \frac{\sin x}{x} = 0$

7. (2) BONUS. Find the equation of the tangent line to the function $y = \sqrt{4-(x-1)^2}$ at the point $(2, \sqrt{3})$.