Math 124 D,F (Einsiedler) Name ____________
28 January 2003
Midterm #1 (50 points) TA: ____________

. Section: ____________

Instructions:

- Your exam contains 6 problems. The entire exam is worth 50 points. The point value of each problem is clearly marked.
- Your exam should contain 5 pages; please make sure you have a complete exam.
- Box in your final answer when appropriate.
- When appropriate, carry out calculations to at least two decimal places.
- Unless stated otherwise, you **MUST** show work for credit. No credit for answers only. No graphing calculators are allowed. If in doubt, ask for clarification.
- Make sure to do your own work on the exam.

Problem #1 (12pts) ____________

Problem #2 (5pts) ____________

Problem #3 (13pts) ____________

Problem #4 (10pts) ____________

Problem #5 (5pts) ____________

Problem #6 (5pts) ____________

TOTAL (50 pts) ____________

1. Determine if the following limits exist. If the limit does not exist, explain why. If the limit exists, compute the limit. Make sure to justify any steps. (No credits for numerical guesses.)

   (a) (4pts)

$$\lim_{r\to 0} \frac{(2+r)^2-4}{3r(r+2)} =$$

   (b) (4pts)

$$\lim_{x\to -2} \frac{x^2+7x+10}{x+2} =$$

   (c) (4pts)

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

2. (5pts) Determine where the following function is continuous. Show your work.

$$f(x) = \frac{\tan x}{\sqrt{4-x^2}}$$

3. Suppose $y = \sqrt{x}$.

(a) (7 pts) Find an expression for the average rate of change in the interval $[4, 4+h]$, and simplify.

(b) (3pts) Calculate the instantaneous rate of change at 4. (No credits if the answer is not obtained by using the average rate of change.)

(c) (3pts) Write down the equation for the tangent of the curve $y = \sqrt{x}$ at the point $(4, 2)$.

4. The number of cells $n(t)$ after t hours in a controlled laboratory experiment is first growing exponentially. When the experiment begins there are 100 cells, after 2 hours there are 200 cells. When there are 10^6 cells the growth stops, from then on $n(t)$ remains constant.

   (a) (5pts) Find out after how many hours the growth stops.

   (b) (5pts) Write down a formula for $n(t)$ (using a multipart rule).

5. (5pts) An object is attached to a spring, its position $x(t)$ changes according to a sinusoidal function. You watch the movement and notice that the object is farthest to the left $x = 3$ (minimal value of x) at $t = 1$, and farthest to the right $x = 7$ at $t = 3$. Write down the sinusoidal function $x(t)$.

6. (5pts) The function f is defined for $x < -2$ by $f(x) = x^2 + 1$. Find the inverse function of f.