MATH - 101 Calculus I March 26, 2003
Test No. 1 Semester 022 Time: 8:00 - 9:15 pm

Serial #:_____ Student #:_____
Name:_____ Section #:____

Show all your work. No credits for answers not supported by work

Problem 1. (32 points) Find the limit if it exists. If it is ∞ or does not exist, show why.

(a) $\lim_{x\to 1} \sqrt[3]{x-1} = 0$

(b) $\lim_{x\to 0} x|x| = 0$

(c) $\lim_{x\to -1} (\frac{x^2-1}{x+1})^3 = 8$

(d) $\lim_{x\to\infty} [\sqrt{x+1} - x] = \lim_{x\to\infty} \{\sqrt{x+1} - x\} = -\infty$

Problem 2. (24 points)

(a) Find $\lim_{x\to 0} \frac{\sin x}{\sqrt{x}} = 0$

(b) Find $\lim_{x\to\infty} \frac{\sin x}{\sqrt{x}} = 0$

(c) Find all vertical and horizontal asymptotes of $f(x) = \frac{x^2-1}{(x-1)^2(x-3)}$, if any exists.

Problem 3. (20 points)

(a) A particle moves on a line such that its position at time t is $s(t) = 3t^2 + t$. Find the average velocity of the particle over the interval $[1,3]$. Also find the the instantaneous velocity at $t = 1$.

(b) Find the set of points where the function is continuous. $f(x) = \frac{x}{\sqrt{2-x}}$

(c) Use the intermediate value theorem to show that the equation $x^2 - x - 1 = 0$ has a root between 1 and 2.

(d) Find all values of c which will make the function $f(x)$ continuous.

$$f(x) = \begin{cases} x + c & if \quad x \geq 2 \\ cx^2 - 1 & if \quad x < 2. \end{cases}$$

Problem 4. (24 points)

(a) Find the equation of the line tangent to the graph of the curve $f(x) = \sqrt{x}$ at $(1,1)$.

(b) Use the definition to show that $\lim_{x\to\infty} \frac{1}{x^2} = 0$. If $\in = 0.01$, find the smallest value on N which satisfies the definition of the limit.

(c) Use the definition of derivative to find $f'(2)$, where $f(x) = \frac{1}{x^2}$.