Name: _____ **Instructor:** _____

Math 119, Calculus
Fall Semester 2003
Exam 1,Version 2
Tuessday, Sept 23

This Examination contains **16** problems, worth a total of **100** points, on **10** sheets of paper including the front cover. The first **12** problems (Section A) are multiple choice with no partial credit, and each is worth **5** points. Record your answers to these problems by placing an $\times$ through one letter for each problem below:

1.	a	b	c	d	e	7.	a	b	c	d	e
2.	a	b	c	d	e	8.	a	b	c	d	e
3.	a	b	c	d	e	9.	a	b	c	d	e
4.	a	b	c	d	e	10.	a	b	c	d	e
5.	a	b	c	d	e	11.	a	b	c	d	e
6.	a	b	c	d	e	12.	a	b	c	d	e

The last **4** problems (Section B) are partial credit problems worth **10** points each. For these problems, **show** your computations and **clearly** mark your answers on the page. Books, notes and calculators are not allowed.

Sign the pledge: "On my honor, I have neither given nor received unauthorized aid on this Exam":

_____

GOOD LUCK

Part A: Multiple Choice Problems

1. (5 pts.) Which of the following is the value of the limit

$$\lim_{x\to 4} \frac{x-4}{\sqrt{x}-2} \quad ?$$

a) 0 b) 2 c) 4 d) $\frac{1}{2}$ e) does not exist

2. (5 pts.) What is the domain of the function $f(x) = \sqrt[4]{16-4x^2}$?

a) $x \le -\sqrt{2}$ or $x \ge \sqrt{2}$ b) $-2 \le x \le 2$ c) $-\sqrt{2} \le x \le \sqrt{2}$

d) All real numbers e) $x \le -2$ or $x \ge 2$.

3. (5 pts.) Let

$$f(x) = \begin{cases} x^2 + c, & \text{if } x < 1 \\ 1 + cx, & \text{if } x \ge 1 \end{cases}$$

where c is a constant. For which value or values of c is $f(x)$ continuous at $x = 1$?

a) $c = 1$ only b) $c = 0$ only c) $c = 0$ and $c = 1$ only

d) any value of c e) No value of c makes $f(x)$ continuous at $x = 1$.

4. (5 pts.) Find $f'(x)$ given that

$$f(x) = (x^2 + 1)\tan x$$

a) $2x\sec^2 x + (x^2+1)\tan x$ b) $2x\sec^2 x$ c) $2x\tan x$

d) $2x\tan x + (x^2+1)\sec^2 x$ e) $2x\tan x + \sec^2 x$

5. (5 pts.) Find

$$\lim_{x \to 2^+} g(x)$$

by examining the graph of $g(x)$ sketched below:

a) $\frac{1}{2}$ b) 2 c) 0 d) 1 e) does not exist.

6. (5 pts.) Which of the following is the value of the limit

$$\lim_{x \to 0} \frac{(\sin x)^2}{x \cos x} \quad ?$$

a) the limit does not exist (b) 8 (c) 4 (d) 2 (e) 0.

7. (5 pts.) Given the function $f(x) = x^2 - 2x - 3$ find the equation of the tangent line to the graph of $f(x)$ that is parallel to the x-axis.

a) $y = -4$ b) $y = 2x - 2$ c) $y = -4x$

d) $y = x - 3$ e) $y = -3$

8. (5 pts.) Which of the following is the value of the limit

$$\lim_{\Delta x \to 0} \frac{2(x + \Delta x)^2 - 2x^2}{\Delta x} \quad ?$$

a) $2x$ (b) $4x$ (c) $2x^2$ (d) $4x^2$ (e) 0.

9. (5 pts) Consider the function

$$f(x) = \frac{x^2 - 2x + 1}{x^2 - 3x + 2}.$$

Which of the following statements is true?

(a) The graph of f has a vertical asymptote only at $x = 2$
(b) The graph of f has a vertical asymptotes only at $x = 1$
(c) The graph of f has vertical asymptotes only at $x = 1$ and at $x = 2$
(d) The graph of f has no vertical asymptotes
(e) The graph of f has a vertical asymptote at $x = 0$, at $x = 1$ and at $x = 2$

10. (5 pts.) Find the derivative of

$$f(x) = \frac{x^2 + 2x + 3}{x^2 + 3}.$$

a) $\dfrac{-2x^2 + 6}{2x}$ b) $\dfrac{2x + 2}{(x^2 + 3)^2}$ c) $\dfrac{2x + 2}{2x}$

d) $\dfrac{2x^2}{(x^2 + 3)^2}$ e) $\dfrac{-2x^2 + 6}{(x^2 + 3)^2}$

11. (5 points) Consider the function

$$f(x) = \frac{x^2 - 4}{x^2 - 9}.$$

Which of the following statements (I)–(IV) about f is true:

(I) $\lim_{x \to 3^-} f(x) = +\infty$ (II) $\lim_{x \to 3^+} f(x) = -\infty$

(III) $\lim_{x \to -3^-} f(x) = +\infty$ (IV) $\lim_{x \to -3^+} f(x) = -\infty$

a) (I) and (II) b) (III) and (IV) c) (I) and (III)

d) (II) and (III) e) (I) and (IV).

12. (5 pts.) Find the instanteneous rate of change of y with respect to t for

$$y = \frac{1}{t} + \frac{t}{2}$$

a) $-\frac{1}{t^2} + \frac{1}{2}$ b) $-\frac{1}{t^2}$ c) $\frac{3}{2}$ d) -2 e) None of the above

Part B: Partial Credit Problems

13. (10 pts.) Consider the function

$$f(x) = \begin{cases} 1, & \text{if } x < 1 \\ 2x - 1, & \text{if } 1 \leq x < 2 \\ x^2 - 2, & \text{if } x \geq 2. \end{cases}$$

a) Compute the following:

$\lim_{x \to 1^-} f(x)$

$\lim_{x \to 1^+} f(x)$

$\lim_{x \to 1} f(x)$

b) Is the function $f(x)$ continuous at $x = 1$? Explain.

c) Is the function f(x) continuous at $x = 2$? Explain.

14. (5 pts.) Find the equations of the lines tangent to the graph of $f(x) = x^3 + 2$ and parallel to the line $3x - y - 4 = 0$.

15. (10 pts.) Find the derivative of the function

$$f(x) = \frac{1}{x+2}$$

using the limit definition of the derivative.

16. (10 pts.) The position function of a free falling object is approximately given by the equation

$$s(t) = -5t^2 + v_0 t + s_0,$$

where v_0 is the initial velocity and s_0 is the initial position (t is measured in seconds and s is measured in meters).

A stone is dropped from the top of a building into a pool of water at ground level.

a) If the splash occurs 6 seconds after the stone is dropped, how tall is the building?

b) What is the speed of the stone at its impact with the water?