Name: _____ **Instructor/Section:** _____

Math 119, Calculus
Fall Semester 2000
Exam 2
Thursday, Oct. 26

This Examination contains **16** problems, worth a total of **100** points, on **9** 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 and notes are not allowed. You may use your calculator.

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

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GOOD LUCK

Part A: Multiple Choice or short answer Problems

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

$$\lim_{t \to 0} \frac{\sin(4t)}{\tan(5t)} \quad ?$$

a) $\frac{5}{4}$ b) $\frac{4}{5}$ c) 0 d) undefined e) $\frac{5\cos(5t)}{4\cos(4t)}$

2. (5 pts.) Suppose

$$xy = x^2 + xy^3 \quad .$$

Find $\frac{dy}{dx}$.

3. (5 pts.) Let $f(x) = x^3 + x, 0 \leq x \leq 2$. For which value of c is it true that $0 \leq c \leq 2$ and

$$f'(c) = \frac{f(2) - f(0)}{2 - 0} \quad ?$$

a) $-\frac{2}{\sqrt{3}}$ b) -1 c) 0 d) 2 e) $\frac{2}{\sqrt{3}}$

4. (5 pts.) Let $f(x) = x + \cos(x)$. For which of the following values of x does the graph of $y = f(x)$ have a horizontal tangent?

a) $\frac{3\pi}{2}$ b) 2π c) $\frac{\pi}{2}$ d) 1 e) π.

5. (5 pts.) The force of attraction between two giant frogs is given by the formula

$$F(r) = \frac{2}{r^2 + 1}$$

newtons, where r is the distance between the two frogs. What is the rate of change in the force with respect to r when $r = 2$?

6. (5 pts.) The position of a particle is given by the function $f(t) = \dfrac{t^2 + 1}{t}$, where t is the time measured in seconds. What is the acceleration of the particle after 2 seconds?

7. (5 pts.) Find the derivative of $f(x) = \tan^2(3x)$

8. (5 pts.) Find the derivative of $f(x) = \sqrt{x^3 + x^2 - 4x}$.

9. (5 pts.) Suppose that $f = g \circ h$, $g(0) = 1, h(0) = 1, g(2) = 4, h(2) = 3$, $g'(0) = 3, h'(0) = 2, g'(1) = 3, h'(1) = 11, g'(2) = 4$, and $h'(2) = 6$. What is $f'(0)$?

a) 33 b) 6 c) 8 d) 4 e) 0.

10. (5 pts.) Suppose a function $f(x)$ has $f'(1) = 0$ and $f''(1) = 86.5$. Which of the following are true?

a) $f(x)$ has a local maximum at $x = 1$.

b) $f(x)$ has neither a local maximum nor a local minimum at $x = 1$.

c) $f(x)$ has a local minimum at $x = 1$.

d) $f(x) = (x - 1)^2$.

e) The slope of the tangent line to the graph of $f(x)$ is equal to 3 when $x = 1$.

11. (5 pts.) A particle moves along the curve $y = \sqrt{x^2 + 5}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/sec. How fast is the x-coordinate of the point changing at that instant?

12. (5 pts.) Find the equation of the tangent line to the curve $f(x) = \sin(2x) + \cos(x)$ at the point $(\frac{\pi}{4}, 1 + \frac{\sqrt{2}}{2})$.

Part B: Partial Credit Problems

13. (10 pts.) Suppose George is five meter north of a soccer ball and Jennifer is four meter east of the soccer ball that is motionless on the ground. Suppose George starts to run toward the ball at a speed of one meter per second, and Jennifer does not move. How quickly is the distance between George and Jennifer changing after one second?

14. (10 pts.) Find the absolute maximum and absolute minimum values of

$$f(x) = x^3 - 12x, \qquad x \in [-3, 4]$$

.

15. (10 pts.) Compute the first and second derivatives of

$$f(x) = x \sin(x)$$

.

16. (10 pts.) Consider the function $f(x) = \dfrac{x}{x^2+4}$.

a) Find the set of critical numbers of f.

b) Find local maxima and minima of f.