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

Math 119, Calculus
Fall Semester 2001
Exam 2
Thursday, Nov. 1

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, 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

$$\lim_{t\to 0} \frac{3t}{\tan(6t)} \quad ?$$

a) $\dfrac{\cos(6t)}{2}$ b) 2 c) 0 d) undefined e) $\dfrac{1}{2}$

2. (5 pts.) Suppose

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

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

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

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

3. (5 pts) What is the linear approximation to the function $f(x) = \sqrt{x+7}$ at $x = 2$?

a) $3 + \dfrac{1}{6}(x+7)$ b) $3 + \dfrac{1}{6}\sqrt{x-2}$ c) $3 + \dfrac{1}{6}(x-2)$

d) $3 + \dfrac{1}{2}(x-2)$ e) $3 + \dfrac{1}{3}(x-2)$

4. (5 pts.) Let $f(x) = x + 2\sin(x)$. For which of the following values of x does the graph of $y = f(x)$ have a horizontal tangent?

a) π b) $\frac{2\pi}{3}$ c) $\frac{5\pi}{4}$ d) 1 e) $\frac{\pi}{3}$

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

a) $\frac{1}{4}$ b) $\frac{5}{4}$ c) 0 d) $\frac{3}{4}$ e) $\frac{7}{4}$

6. (5 pts.) Which of the following is the derivative $f'(x)$ of $f(x) = \sec^3(5x)$?

a) $15\sec(5x)\tan(5x)$ b) $15\sec^3(5x)$ c) $15\sec^3(5x)\tan(5x)$

d) $15\sec^2(5x)$ e) $3\sec^2(5x)\tan(5x)$

7. (5 pts.) Suppose that $f(x) = g(h(x))$ where $g(-1) = 3, h(2) = -1, g(2) = 7$, $g'(2) = 11, h'(2) = -5$ and $g'(-1) = 2$. What is $f'(2)$?

a) 21 b) -10 c) 6 d) -7 e) 0

8. (5 pts.) Suppose a function $f(x)$ has $f''(x) > 0$ for all numbers x and that $f'(2) = 0$. Which of the following must be true?

a) $f(x)$ takes its absolute minimum value at $x = 2$ b) $f'(1) > 0$

c) $f(x)$ has an absolute minimum at $x = 0$ d) $f'(4) < 0$

e) $f(x)$ has a local maximum at $x = 2$

9. (5 pts.) If $f(x) = (1 + \sin^2 x)^{100} + \pi$ then what is the value of $f'(0)$?

a) $100 + \pi$ b) π c) 100 d) 0 e) 100π

10. (5 pts.) If $f(x) = x^3 + 1$ then the point (0, 1) is a

a) point of inflection of f b) local maximum of f

c) local minimum of f d) absolute maximum of f

e) absolute minimum of f

11. (5 pts.) If we use the linear approximation of the function $f(x) = \sqrt{x + 16}$ at $a = 0$ then $\sqrt{16.1}$ is approximately equal to

a) $4 + \frac{1}{70}$ b) $4 + \frac{1}{10}$ c) $4 + \frac{1}{20}$

d) $4 + \frac{1}{30}$ e) $4 + \frac{1}{80}$

12. If $f(x) = \sqrt{3^2 + (4x)^2}$, then which of the following is equal to $f'(x)$?

a) $\dfrac{x}{2\sqrt{9+16x^2}}$ b) $\dfrac{16x}{\sqrt{9+16x^2}}$ c) $\dfrac{32x}{\sqrt{9+16x^2}}$

d) $\dfrac{8x}{\sqrt{9+16x^2}}$ e) $\dfrac{32x}{(9+16x^2)^{3/2}}$

Part B: Partial Credit Problems

13. (10 pts.) At noon, the Luxuritania is 10 km East of lighthouse L, sailing East from L at a speed of 10 km/hr, while the Luxitanic is 10km North of L sailing directly towards L at 5km/hr. How quickly is the distance between the Luxuritania and the Luxitanic changing at noon?

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

$$f(x) = x^3 - 3x, \qquad \text{for } -1 \leq x \leq 2.$$

15. (10 pts.) Find the first and second derivatives dy/dx and d^2y/dx^2 of the function $x^3 + xy + y^2 = 1$ at the point $x = 0$ and $y = 1$.

16. (10 pts.) Let $f(x) = x^4 - 4x^3 + 1$. Find

(a) $f^{'}(x)$ and $f^{''}(x)$

(b) the intervals on which the function is increasing or decreasing

(c) the local maximum values and local minimum values (if any)

(d) the intervals on which the function is concave up or concave down.