Name: _____   **Instructor:** _____

Math 119, Calculus
Fall Semester 2000
Exam 1
Thursday, Sept 21

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 × 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":

_____

GOOD LUCK

Part A: Multiple Choice Problems

1. (5 pts.) 1. Which of the following lines is parallel to the line $y = \dfrac{3}{2}x + 5$?

    a) $y = 3$ b) $2y + 3x - 5 = 0$ c) $3y - 2x - 5 = 0$

         d) $3y + 2x - 11 = 0$ e) $2y - 3x - 7 = 0$

2. (5 pts.) What is the domain of the function $f(x) = \sqrt[4]{8 - 4x^2}$?

    a) $-2 < x < 2$ b) $x \leq -\sqrt{2}$ or $x \geq \sqrt{2}$ c) $-\sqrt{2} \leq x \leq \sqrt{2}$

         d)   All real numbers   e) $x \leq -2$ or $x \geq 2$.

3. (5 pts.) Find the radius of the circle

$$2x^2 + 12x + 2y^2 + 4y = -16$$

    a) 0   b) 2   c) $\sqrt{-16}$ d) 4   e) $\sqrt{2}$.

4. (5 pts.) Which of the following is the value of the limit

$$\lim_{x \to 4} \frac{x^2 - 16}{\sqrt{x} - 2} \quad ?$$

    a) 32   (b) 16   (c) 8   (d) 2   (e) 1.

5. (5 pts.) The height $f(t)$ in feet of a ball t seconds after it is thrown vertically into the air is given by the formula $f(t) = 64t - 16t^2$. Find the average velocity (in feet per second) of the ball over the time period from $t = 1$ to $t = 2$.

a) 64   b) -32 c) 48   d) 16   e) -48.

6. (5 pts.) Let
$$f(x) = \begin{cases} 4x^2 - c, & \text{if } x < 1 \\ cx, & \text{if } x \geq 1 \end{cases}$$
where c is a constant. What value of c makes $f(x)$ continuous?

a) -2   b) 0   c) 1   d) 2

e) No value of c makes $f(x)$ continuous.

7. (5 pts.) A particle moves so that its position at time t is given by
$$s(t) = 2t^2 + \frac{4}{\sqrt[3]{t^2}}.$$

Which of the following is an expression for the instantaneous velocity of the particle at time t?

a) $4t + 12t^{\frac{1}{3}}$ b) $4t - \frac{8}{3}t^{-\frac{5}{3}}$ c) $4t + \frac{8}{3}t^{-\frac{5}{3}}$

d) $4t - 12t^{\frac{5}{3}}$ e) $4t - 12t^{-\frac{1}{3}}$.

8. (5 pts.) If $f(x) = \dfrac{1}{\sqrt{x-1}}$, which of the following equals $\dfrac{f(3+h) - f(3)}{h}$?

a) $\dfrac{-1}{(\sqrt{3} + \sqrt{3+h})\sqrt{3}\sqrt{3+h}}$

b) $\dfrac{-1}{(\sqrt{2} + \sqrt{2+h})\sqrt{2}\sqrt{2+h}}$

c) $\dfrac{-1}{(\sqrt{2} - \sqrt{2+h})\sqrt{2}\sqrt{2+h}}$

d) $\dfrac{-\sqrt{2+h}}{(\sqrt{2} + \sqrt{2+h})\sqrt{2}}$

e) $\dfrac{1}{(\sqrt{2} + \sqrt{2+h})\sqrt{2}\sqrt{2+h}}$

9. (5 pts.) If $h(x) = \dfrac{x-1}{x^2+1}$, find $h'(x)$.

a) $\dfrac{x^2 + 2x + 1}{x^2 + 1}$

b) $\dfrac{x^2 + 2x + 1}{(x^2+1)^2}$

c) $\dfrac{-x^2 + 2x + 1}{(x^2+1)^2}$

d) $\dfrac{-x^2 + 2x + 1}{x^2 + 1}$

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

10. (5 pts.) Let $f(x)$ denote any differentiable function of x. Which of the following is an expression for the derivative $g'(x)$ of the function $g(x) = x^3 f(x)$?

a) $x^3 f'(x) + 3x^2 f(x)$

b) $3x^2 f'(x) + x^3 f(x)$

c) $x^3 f'(x) + x^2 f(x)$

d) $x^2 f'(x) + x^3 f(x)$

e) $x^3 f'(x) + x^3 f(x)$.

11. (5 pts.) If $\sin(\theta) = \dfrac{3}{4}$, and $\pi/2 < \theta < \pi$, what is $\cos(\theta)$?

a) $-\dfrac{1}{4}$ b) $\dfrac{\sqrt{7}}{4}$ c) $-\dfrac{\sqrt{7}}{4}$ d) $\dfrac{1}{4}$

e) Cannot be determined

12. (5 pts.) Let the number x of heartbeats of a mouse after t seconds be given by the following values:

t	17	18	19	20	21	22	23
x	25	29	34	40	48	57	68

Which of the following is the best estimate for the rate of heartbeats of the mouse when $t = 20$?

a) 4 beats/second   b) 7 beats/second   c) 11 beats/second

d) 40 beats/second   e) 0 beats/second

Part B: Partial Credit Problems

13. (10 pts.) Consider the graph of the function $f(x)$ pictured below.

For each of the following, either give the value of the limit, or indicate why it does not exist.

a) $\lim_{x \to 5^+} f(x)$

b) $\lim_{x \to 5^-} f(x)$

c) $\lim_{x \to 5} f(x)$

d) $\lim_{x \to 2} f(x)$

14. (10 pts.) Let $f(x) = \dfrac{1}{x+2}$.

a) Find the slope $m(h)$ of the secant line joining the points

$$(1, f(1)) \quad \text{and} \quad (1+h, f(1+h))$$

on the graph of $y = f(x)$.

Answer:

b) Using your answer to (a), compute the value of the limit

$$\lim_{h \to 0} m(h)$$

using only algebra and the limit laws.

Answer:

15. (10 pts.) Let $f(x) = |x| - |1 - x|$.

a) Complete the following table of values of the function $f(x)$.

x	-2	-1	0	1	2
$f(x)$					

b) Graph $y = f(x)$ on the interval $-2 \leq x \leq 2$. Make sure to include a scale on the x and y axes.

16. (10 pts.) Find the equation of the tangent line to $y = \sqrt{x-1}$ at the point $(5, 2)$.

Answer: