MA 123 — Elem. Calculus SPRING 2007
FINAL EXAM 30 April 2007

Name: _____ **Sec.:** _____

Do not remove this answer page — you will turn in the entire exam. You have two hours to do this exam. No books or notes may be used. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of 15 multiple choice questions. Record your answers on this page by filling in the box corresponding to the correct answer. For example, if (a) is correct, you must write

[a] [b] [c] [d] [e]

Do not circle answers on this page, but please do circle the letter of each correct response in the body of the exam. It is your responsibility to make it CLEAR which response has been chosen. You will not get credit unless the correct answer has been marked on both this page and in the body of the exam.

GOOD LUCK!!!!

1. [a] [b] [c] [d] [e]

2. [a] [b] [c] [d] [e]

3. [a] [b] [c] [d] [e]

4. [a] [b] [c] [d] [e]

5. [a] [b] [c] [d] [e]

6. [a] [b] [c] [d] [e]

7. [a] [b] [c] [d] [e]

8. [a] [b] [c] [d] [e]

9. [a] [b] [c] [d] [e]

10. [a] [b] [c] [d] [e]

11. [a] [b] [c] [d] [e]

12. [a] [b] [c] [d] [e]

13. [a] [b] [c] [d] [e]

14. [a] [b] [c] [d] [e]

15. [a] [b] [c] [d] [e]

For grading use:

Total	
	(out of 100 pts)

Name: _____ **Sec.:** _____

Please make sure to list the correct section number on the front page of your exam and on this page. In case you forgot your section number, consult the following table:

Section #	**Instructor**	**Lectures**
001	J. Robbins	MWF 12:00pm-12:50pm, BS 107
002	P. Perry	MWF 2:00pm-2:50pm, CB 118
003	J. Robbins	TR 3:30pm-4:45pm, CB 337
401	S. Speakman	MW 7:30pm-8:45pm, CB 339
402	N. Kirby	TR 6:00pm-7:15pm, CB 339

Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

1. At 12:00 noon a boat is 15 miles due north of a lighthouse. The boat is moving east at 20 miles per hour. How fast is the distance from the boat to the lighthouse increasing one hour later?

Possibilities:

(a) 20 miles per hour
(b) 13 miles per hour
(c) 12.8 miles per hour
(d) 25 miles per hour
(e) 16 miles per hour

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2. Suppose that $g'(x) = x^2 - x - 6$. Find the interval(s) where $g(x)$ is increasing.

Possibilities:

(a) $(-1, 2)$
(b) $(-\infty, -2)$ and $(3, \infty)$
(c) $(-\infty, -1)$ and $(2, \infty)$
(d) $(-2, 3)$
(e) It cannot be determined from the information given

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3. Find the general antiderivative $\int (x+5)^2\, dx$.

Possibilities:

(a) $3(x+5)^2 + C$
(b) $(x+2)^{-1} + C$
(c) $-2(x+2)^{-3} + C$
(d) $-(x+2)^{-1} + C$
(e) $\frac{1}{3}(x+5)^3 + C$

---

4. Let $T(x) = \dfrac{g(x)}{f(x)}$. If $f(2) = 3$, $f'(2) = 4$, $g(2) = 5$, and $g'(2) = 6$, find $T'(2)$.

Possibilities:

(a) $\dfrac{38}{9}$

(b) $\dfrac{38}{25}$

(c) $\dfrac{2}{25}$

(d) $-\dfrac{2}{9}$

(e) 38

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5. Let $A(x) = \int_0^x t^2 + t^4 + t^6 \, dt$. Find the value of x on $[1, 50]$ where $A(x)$ takes its minimum value.

Possibilities:

(a) 1

(b) $1^2 + 1^4 + 1^6$

(c) 25

(d) $50^2 + 50^4 + 50^6$

(e) 50

---

6. The integral

$$\int_2^5 f(x) \, dx$$

is computed as

$$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{12}{n} \left(2 + \frac{3k}{n}\right)^3.$$

What is $f(x)$?

Possibilities:

(a) $6x^2$

(b) $8x^2$

(c) $12x$

(d) $4x^3$

(e) $x^2 + 1$

---

7. Let $k(x) = x^3 + 2x$. Find a value of c between 1 and 3 such that the average rate of change of $k(x)$ from $x = 1$ to $x = 3$ is equal to the instantaneous rate of change of $k(x)$ at $x = c$.

Possibilities:

(a) 30

(b) 15

(c) $\sqrt{\frac{28}{3}}$

(d) $\sqrt{\frac{13}{3}}$

(e) 60

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8. Let $g(t) = (t-5)^2 + 1$. What is the average rate of change of $g(t)$ as t changes from 4 to $4 + h$.

Possibilities:

(a) $h^2 - 2h$

(b) $h + 2$

(c) $h^2 + 2h$

(d) $h - 2$

(e) 1

---

9. Find the minimum of $f(x) = \sqrt{x^2 - 2x + 16}$ on the interval $[0, 5]$.

Possibilities:

(a) 1

(b) 2

(c) $\sqrt{15}$

(d) $\sqrt{12}$

(e) 0

---

10. The equation of the tangent line to the graph of $y = g(x)$ at $x = 3$ is $y = 2 + 4(x - 3)$. What is the value of $k'(3)$?

Possibilities:

(a) -6

(b) 4

(c) -12

(d) 0

(e) 2

---

11. Let $f(x) = \ln(x + 2) + 1$. Use the limit definition of the derivative and a calculator to estimate $f'(4)$. Your answer should be correct to four decimal places.

Possibilities:

(a) 0.1667

(b) 0.2500

(c) 0.1429

(d) 0.2000

(e) 1.0000

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12. Find an equation for the line that is perpendicular to the line $y = 2x$ and contains the point $(-1, 5)$

Possibilities:

(a) $y = 5 + 2(x + 1)$

(b) $y = 5 + 2(x - 1)$

(c) $y = 5 + \frac{1}{2}(x + 1)$

(d) $y = 5 + -2(x + 1)$

(e) $y = 5 - \frac{1}{2}(x + 1)$

---

13. Let $h(x) = \int_4^x \sqrt{t^2+3}\,dt$. Find $h'(x)$.

Possibilities:

(a) $\dfrac{1}{2}(x^2+3)^{-1/2} \cdot 2x$

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

(c) $-\dfrac{2}{x^3}$

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

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

---

14. Find $\int_1^2 x^2 + 2x + 1\,dx$.

Possibilities:

(a) 4

(b) $19/3$

(c) 9

(d) 3

(e) $29/6$

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15. Find the limit or state that it does not exist.

$$\lim_{x \to 4} \frac{x^2 + x - 20}{x - 4}$$

Possibilities:

(a) 8

(b) -20

(c) -15

(d) 9

(e) Does Not Exist
