MA 123 — Elementary Calculus Spring 2010
THIRD MIDTERM EXAM 4/14/2010

Name: _____ **Sec.:** _____

Do not remove this answer page — you will return the whole exam. You will be allowed two hours to complete this test. 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 (b) 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:

number of correct problems	**(out of 15)**
Total	**(out of 100 pts)**

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

Section #	Instructor	Lectures
001	M. Shaw	MWF 12:00 pm - 12:50 pm, CP 153
002	T. Chapman	MWF 2:00 pm - 2:50 pm, CP 139
003	P. Koester	TR 12:30 pm - 1:45 pm, CP 153
004	M. Shaw	MWF 9:00 am- 9:50 am, BS 116
005	P. Koester D. Moore	MWF 1:00 pm - 1:50 pm, CB 122 T 11:00 am - 12:15, CB 303
006	P. Koester J. Polly	MWF 1:00 pm - 1:50 pm, CB 122 R 11:00 am - 12:15, DH 301
007	P. Koester D. Moore	MWF 1:00 pm - 1:50 pm, CB 122 T 9:30 am - 10:45, CB 243
008	P. Koester J. Polly	MWF 1:00 pm - 1:50 pm, CB 122 R 9:30 am - 10:45, CB 243
009	D. Leep A. Barra	MWF 10:00 am - 10:50 am, CP 320 T 1:00 pm - 2:15, CP 397
010	D. Leep A. Barra	MWF 10:00 am - 10:50 am, CP 320 R 1:00 pm - 2:15, CB 304
011	D. Leep A. Barra	MWF 10:00 am - 10:50 am, CP 320 T 2:30 pm - 3:45, CP 246
012	D. Leep A. Barra	MWF 10:00 am - 10:50 am, CP 320 R 2:30 pm - 3:45, CP 235
013	A. Corso	MWF 12:00 pm - 12:50 pm, CB 110
401	D. Little	TR 6:00 pm-7:15 pm, CB 339
402	D. Little	TR 7:30 pm-8:45 pm, 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.

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1. Suppose that the derivative $f'(x) < 0$ for all x in the interval $(0, 5)$. Which statement is definitely true?

Possibilities:

(a) $f(x)$ is concave up on the interval $(0, 5)$

(b) $f(x)$ is concave down on the interval $(0, 5)$

(c) $f(x)$ is increasing on the interval $(0, 5)$

(d) $f(x)$ is decreasing on the interval $(0, 5)$

(e) The graph of $f(x)$ must be above the x-axis on the interval $(0, 5)$.

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2. Suppose $g(t) = t^4 - 10t^2 + 14$. Find the smallest A so that $g(t)$ is decreasing on the entire interval $(0, A)$.

Possibilities:

(a) $A = \sqrt{6}$

(b) $A = \sqrt{5}$

(c) $A = \sqrt{5.5}$

(d) $A = -\sqrt{5.5}$

(e) $A = -\sqrt{5}$

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3. Suppose that the first and second derivatives of $f(x)$ are given by $f'(x) = (1 - 5x)\, e^{-5x}$ and $f''(x) = 5(5x - 2)\, e^{-5x}$. Find the largest interval on which $f(x)$ is concave up.

Possibilities:

(a) $(-\infty, 5)$

(b) $(5, \infty)$

(c) $(\frac{1}{5}, \infty)$

(d) $(-\infty, \frac{2}{5})$

(e) $(\frac{2}{5}, \infty)$

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4. Determine the x coordinate of the inflection point of

$$g(x) = 3x^3 - 5x^2 + x + 15.$$

Possibilities:

(a) $x = 1$

(b) $x = \dfrac{5}{6}$

(c) $x = \dfrac{5}{9}$

(d) $x = \dfrac{1}{9}$

(e) $x = \dfrac{5}{7}$

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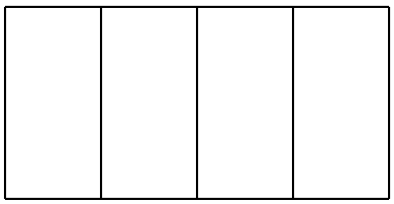
5. A rectangle is to be constructed with 4 vertical partitions (i.e., 5 vertical walls and 2 horizontal walls) as in the figure below. The rectangle is to be constructed with 3000 feet of material. Let x denote the length of the horizontal wall and y the length of the vertical wall. Which optimization problem needs to solved in order to determine how to enclose the largest area?



Possibilities:

(a) Maximize $A = 2x + 4y$, given that $xy = 3000$.

(b) Maximize $A = 2x + 5y$, given that $xy = 3000$.

(c) Maximize $A = xy$, given that $2x + 4y = 3000$.

(d) Maximize $A = xy$, given that $2x + 5y = 3000$.

(e) Maximize $A = xy$, given that $2x + 6y = 3000$.

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6. Two positive real numbers, x and y, satisfy $5x + y = 25$. What is the maximum possible product of these two numbers?

Possibilities:

(a) $\dfrac{125}{4}$

(b) $\dfrac{5}{2}$

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

(d) 30

(e) 15

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7. A ladder of length 15 feet rests against a wall. The bottom of the ladder is being pulled away from the wall at a rate of 4 feet per second. How fast is the top of the ladder sliding down the wall when the bottom of the ladder is 12 feet from the wall? (Just give the numeric value of the answer. Do not worry about the plus or minus sign.)

Possibilities:

(a) 4

(b) 6

(c) $\frac{5}{2}$

(d) $\frac{9}{2}$

(e) $\frac{16}{3}$

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8. The price P of a share of stock is increasing in value at a rate of 5 dollars per year. An investor is buying shares of stock at the rate of 10 shares per year. How fast is the total value V of the investor's stock growing when the price of the stock is 42 dollars per share and the investor owns 100 shares of the stock? (Hint: Let N denote the number of shares of stock owned. Express V in terms of P and N.)

Possibilities:

(a) 50

(b) 920

(c) 15

(d) 142

(e) 1210

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9. Estimate the area under the curve $f(x) = 2\,x + x^2$ on the interval $[0, 2]$. Use a partition consisting of 4 equal subdivisions and use the left endpoint of each interval as the sample point.

Possibilities:

(a) $\frac{35}{4}$

(b) $\frac{35}{2}$

(c) $\frac{19}{8}$

(d) $\frac{19}{4}$

(e) $\frac{19}{2}$

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10. Suppose you estimate the area under the graph of $y = \ln x$ on the interval $[6, 11]$ by adding the areas of rectangles as follows: you partition the interval into 10 equal subintervals and you use the right endpoint of each interval to determine the height of the rectangle. What is the area of the first rectangle? (i.e., the rectangle furthest to the left)

Possibilities:

(a) $\frac{1}{2}\ln(5.5)$

(b) $\frac{1}{2}\ln(6)$

(c) $\frac{1}{2}\ln(6.5)$

(d) $\ln(6)$

(e) $\ln(6.5)$

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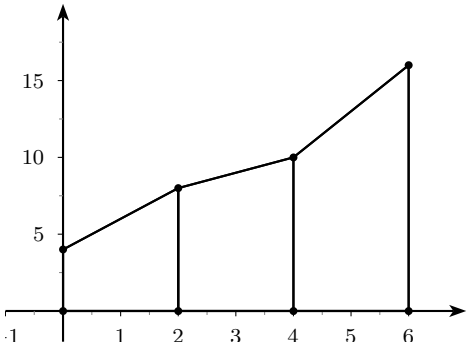
11. Suppose $f(x)$ is a linear function between each of the pairs of consecutive data points given below. Find

$$\int_0^6 f(x)\,dx$$



x	$f(x)$
0	4
2	8
4	10
6	16

Possibilities:

(a) 28

(b) 44

(c) 56

(d) 68

(e) 38

12. Evaluate the sum

$$\sum_{k=3}^{5} \left(k^3 + k^2\right)$$

Possibilities:

(a) 280

(b) 186

(c) 116

(d) 230

(e) 266

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13. Evaluate the sum

$$\sum_{k=1}^{40} \left(4k^2 + 3k\right)$$

Possibilities:

(a) 91020

(b) 91000

(c) 91040

(d) 91060

(e) 91080

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14. Evaluate the sum

$$27 + 30 + 33 + \cdots + 312 + 315$$

Possibilities:

(a) 16695

(b) 16587

(c) 16560

(d) 16245

(e) 16530

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15. Suppose $u'(x) = x^2 - 9$. Where does $u(x)$ takes its minimum on the interval $[-2, 9]$?

Possibilities:

(a) 3

(b) 0

(c) -2

(d) 9

(e) -3

Some Formulas

1. Summation formulas:

$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

2. Areas:

(a) Triangle $A = \dfrac{bh}{2}$

(b) Circle $A = \pi r^2$

(c) Rectangle $A = lw$

(d) Trapezoid $A = \dfrac{b_1 + b_2}{2}\, h$

3. Volumes:

(a) Rectangular Solid $V = lwh$

(b) Sphere $V = \dfrac{4}{3}\pi r^3$

(c) Cylinder $V = \pi r^2 h$

(d) Cone $V = \dfrac{1}{3}\pi r^2 h$