MA123 Final Exam

December 12 2007

NAME _____ Section _____

Problem	Answer
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

Instructions. Circle your answer in ink on the page containing the problem and on the cover sheet. After the exam begins, you may not ask a question about the exam. Be sure you have all pages (containing 15 problems) before you begin. You will find a table of logarithms at the end of the exam that you need for Problem 6.

NAME_____

1. The following table gives the Median Weekly Earnings in dollars for wage and salary workers in the U.S. from 2000 to 2006. (Data from the Bureau of Labor Statistics) Use the given values from the table for the two years, 2000 and 2005, to express earning amount as a linear funtion of time in years. Let A denote amount earned (in dollars) and let t denote time (in years).

Yr.	2000	2001	2002	2003	2004	2005	2006
Amount	576	596	608	620	640	651	671

   (a) $A = 576 + 12(t - 2000)$
   (b) $A = 576 + 13(t - 2000)$
   (c) $A = 576 + 14(t - 2000)$
   (d) $A = 576 + 15(t - 2000)$
   (e) $A = 576 + 16(t - 2000)$

2. For which values of t is the function $t^3 - 2t + 1$ increasing?

   (a) $t > \sqrt{2/3}$ or $t < -\sqrt{2/3}$
   (b) $-\sqrt{2/3} < t < \sqrt{2/3}$
   (c) $0 < t < \sqrt{4/3}$
   (d) $-\sqrt{4/3} < t < 0$
   (e) Never

3. Suppose the price of a good is given by the quadratic function $P(t) = 2.58 + .14t + .01t^2$. What is the instantaneous rate of change in the price when $t = 3$?

   (a) .18
   (b) .20
   (c) .22
   (d) .24
   (e) .26

4. Let
$$f(t) = 1 + 10\sqrt{1+t} - t$$
For what nonnegative value of t is the tangent line to the graph of $f(t)$ horizontal?

(a) 0
(b) 6
(c) 12
(d) 18
(e) 24

5. Find the limit as x tends to 2 from the left if
$$f(x) = \begin{cases} 1 + x^2 & \text{if} \quad x < 2 \\ x^3 & \text{if} \quad x \geq 2 \end{cases}$$

(a) 5
(b) 6
(c) 7
(d) 8
(e) 9

6. Suppose the position $P(t)$ of an object at time t is given by $t^2 + 1$. Find a value of t at which the instantaneous speed of the object equals the average speed on the interval $[0, 1]$.

(a) 1/2
(b) 1
(c) 3/2
(d) 2
(e) 5/2

7. Let $f(x) = x\,|x| - x$. Find the derivative, $f'(0)$, by evaluating the limit

$$\lim_{h \to 0} \frac{f(h) - f(0)}{h}$$

(a) -2
(b) -1
(c) 0
(d) 1
(e) Does not exist

8. Let

$$f(x) = \begin{cases} x & \text{if} \quad 0 \leq x < 1 \\ 2 & \text{if} \quad 1 \leq x < 4 \end{cases}$$

Evaluate the integral

$$\int_0^3 f(x)dx$$

(a) 7/2
(b) 9/2
(c) 11/2
(d) 13/2
(e) 15/2

9. Suppose $H'(4) = 9$. What is the value of $F'(2)$ if $F(s) = H(s^2)$?

(a) 24
(b) 30
(c) 36
(d) 42
(e) 48

10. Suppose

$$\int_0^1 f(x)dx = 4 \quad \text{and} \quad \int_0^1 g(x)dx = 5$$

What is the value of

$$\int_0^1 [2f(x) + g(x)]dx$$

(a) 19
(b) 17
(c) 15
(d) 13
(e) 11

11. Evaluate the limit

$$\lim_{n\to\infty} \frac{2+4+6+8+\cdots+2n}{n^2}$$

(a) 1
(b) 2
(c) 3
(d) 4
(e) 5

12. The length of the horizontal side of a rectangle is increasing at a rate of 3 inches per minute. Suppose the instantaneous rate of change of the area of the rectangle equals zero at the instant that the length of the horizontal side is 2 inches and the length of the vertical side is 5 inches. How fast is the length of the vertical side decreasing at this instant?

(a) 13/2
(b) 15/2
(c) 17/2
(d) 19/2
(e) 21/2

13. Let (a, b) be the point on the line $y = 4 - 2x$ that is closest to the origin $(0, 0)$. What is the distance from (a, b) to $(0, 0)$? Hint: DRAW A PICTURE.

(a) $2\sqrt{5}/5$
(b) $3\sqrt{5}/5$
(c) $4\sqrt{5}/5$
(d) $5\sqrt{5}/5$
(e) $6\sqrt{5}/5$

14. What is the average of the function $h(t) = t^2 + 1$ on the interval $[1, 4]$? Recall that the average of $f(t)$ on an interval $[a, b]$ equals the constant value A such that the area under the graph of the constant function A equals the area under the graph of $f(t)$ for the interval $[a, b]$. In other words,

$$\int_a^b f(t)dt = \int_a^b Adt.$$

(a) 8
(b) 10
(c) 12
(d) 14
(e) 16

15. Suppose the cost, $C(q)$, of stocking a quantity q of a product equals

$$C(q) = 12 + 3q + \frac{8}{q}.$$

The rate of change of the cost with respect to q is called the marginal cost. What is the marginal cost when the cost equals 23 and the cost is decreasing?

(a) -5
(b) -1
(c) 0
(d) 1
(e) 5

Summation Formula

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

Geometric Formulas

1. Areas
   (a) Triangle $A = \frac{bh}{2}$
   (b) Circle $A = \pi r^2$
   (c) Rectangle $A = lw$
   (d) Trapazoid $A = \frac{b_1+b_2}{2}h$
2. Volumes
   (a) Rectangular Solid $V = lwh$
   (b) Sphere $V = \frac{4}{3}\pi r^3$
   (c) Cylinder $V = Bh$
   (d) Cone $V = \frac{1}{3}Bh$