MA123 Exam 2

18 October 2006

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 may use for Problem 2.

NAME_____

1. If $f(x) = (x+3)^2$ then

$$\frac{f(x+h) - f(x)}{h} =$$

   (a) $2x + h$
   (b) $2x + 3 + h$
   (c) $2(x+3) + h$
   (d) $2(x+3)$
   (e) $2x + 8 + h$

2. Suppose $f(x) = \log(x)$ where $\log(x)$ denotes the base 10 logarithm. Use the definition of the derivative and either a calculator or the table of logarithms to find the approximate value of the derivative of f at $x = 2$. Select the answer that best approximates the derivative.

   (a) .102
   (b) .145
   (c) .180
   (d) .217
   (e) .378

3. If $f(x) = x^3 + 4x^2 + 2x + 1$ then $f'(x) =$

   (a) $3x^2 + 8x + 3$
   (b) $x^2 + x + 1$
   (c) $3x^2 + 8x + 2$
   (d) $3x^2 + 8x + 1$
   (e) $3x^2 + 4x + 1$

4. If

$$F(t) = \frac{3t+1}{t-1}$$

then $F'(t) =$

(a) $-4/(t-1)^2$
(b) $-4/(3t+1)^2$
(c) $-2/(t-1)^2$
(d) $-3/(t-1)^2$

5. If $u(t) = \sqrt{4t^2}$, then $u'(-1) =$

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

6. If $h(t) = (t-1)(t+1)(t^2+1)$ then $h'(2)$ equals

(a) 0
(b) 4
(c) 8
(d) 16
(e) 32

7. If $F(x) = u(v(x))$ and

$$\begin{array}{lll} v(1) = 3 & u(1) = 2 & u(3) = 2 \\ v'(1) = 7 & u'(1) = 4 & u'(3) = 1 \end{array}$$

then $F'(1) =$

(a) 6
(b) 7
(c) 8
(d) 9
(e) 10

8. If the line $y = 3 + 4(x - 2)$ is tangent to the graph of $g(x)$ at $x = 2$ and $g(x)$ is differentiable at $x = 2$, then $g(2) + g'(2) =$

(a) 2
(b) 3
(c) 4
(d) 6
(e) 7

9. Let

$$H(s) = \begin{cases} 3(s-1)^2 & \text{if} \quad s \leq 1 \\ 5(s-1)^2 & \text{if} \quad s > 1 \end{cases}$$

Find the equation of the tangent line to the graph of $H(s)$ at $s = 2$ in the (s, t) plane.

(a) The tangent line does not exist
(b) $t = 3 + 6s$
(c) $t = 3 - 6s$
(d) $t = 5 + 10(s - 2)$
(e) $t = 5 + 10(s - 1)$

10. Let

$$g(s) = \frac{s-1}{s+1}$$

Find the maximum of $g(s)$ on the interval $[0, 2]$.

(a) $-1/3$
(b) 0
(c) $1/3$
(d) $2/3$
(e) Neither the maximum nor the minimum exists on the given interval.

11. Suppose the derivative of the function $h(x)$ is given by $h'(x) = 1 - |x|$. Find the value of x in the interval $[-1, 1]$ where $h(x)$ takes on its minimum value.

(a) $-1/2$
(b) -1
(c) 0
(d) $1/2$
(e) 1

12. Suppose

$$f(t) = \begin{cases} t^2 - 2t + 2 & \text{if} \quad t < 1 \\ t^3 & \text{if} \quad t \geq 1 \end{cases}$$

Find the minimum of $f(t)$ on the interval $[0, 2]$.

(a) -1
(b) 0
(c) 1
(d) 2
(e) 8

13. Find the largest value of A such that the function $g(s) = s^3 - 3s^2 - 24s + 1$ is increasing on the interval $(-5, A)$.

    (a) -4
    (b) -2
    (c) 0
    (d) 2
    (e) 4

14. Suppose $f(t) = t^3 - t^2 + t + 1$. Find the limit

$$\lim_{t \to 1} \frac{f(1+h) - f(1)}{h}$$

    Hint: Relate the limit to the derivative.

    (a) -1
    (b) 0
    (c) 1
    (d) 2
    (e) The limit does not exist

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

$$C(q) = \frac{100}{q} + q$$

    For which positive value of q is the tangent line to the graph of $C(q)$ a horizontal line?

    (a) 1/100
    (b) 1/10
    (c) 1
    (d) 10
    (e) 100