MA123 Exam 2

October 17 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 at the end of the exam that you may use for Problem 2.

NAME_____

1. If $f(x) = x^3$ then
$$\lim_{h \to 0} \frac{f(1+h) - f(1)}{h} =$$
Hint: Relate the limit to the derivative of $f(x)$.

   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) 4

2. Suppose $f(x) = 2^x$. Use the definition of the derivative and either a calculator or the table at the end of the exam to find the approximate value of the derivative of f at $x = .4$. Select the answer that best approximates the derivative.

   (a) .43
   (b) .53
   (c) .63
   (d) .93
   (e) 1.13

3. If $f(x) = \frac{x-1}{x+1}$ then $f'(x) =$

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

4. If

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

then the slope of the tangent line to the graph of $F(t)$ at $t = 2$ is

(a) $-1/3$
(b) $-1/2$
(c) 0
(d) $1/3$
(e) $1/2$

5. The equation of the tangent line to the graph of $w = \sqrt{t+1}$ at $t = 3$ is

(a) $w = 2 + (1/3)(t-3)$
(b) $w = 2 + (1/4)(t-3)$
(c) $w = 3 + (1/4)(t-3)$
(d) $w = 3 + (1/6)(t-8)$
(e) $w = 3 + (1/3)(t-8)$

6. Which function is always increasing on $(0, 2)$

(a) $\sqrt{x} + x^2$
(b) $x + (1/x)$
(c) $x^3 - 3x$
(d) $7 - |x|$
(e) $(x-1)^4$

7. If $F(x) = u(x^2) + (v(x))^2$ 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) 20
(b) 30
(c) 40
(d) 50
(e) 60

8. The line $y = -1 + 4(x - 2)$ is tangent to the graph of $g(x)$ at $x = 2$. If $g(x)$ is differentiable at $x = 2$, and $h(x) = xg(x)$, then $h'(2)$ equals

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

9. Let

$$H(s) = |s - 1|$$

Find the equation of the tangent line to the graph of $H(s)$ at $s = 0$ in the (s, t) plane.

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

10. Let

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

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

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

12. Suppose

$$f(t) = \begin{cases} \sqrt{4-t} & \text{if} \quad t < 4 \\ \sqrt{t-4} & \text{if} \quad t \geq 4 \end{cases}$$

Find the minimum of $f(t)$ on the interval $[0, 6]$.

(a) 0
(b) 2
(c) 4
(d) 6
(e) 8

13. Find the value of A such that the average rate of change of the function $g(s) = s^3$ on the interval $[0, A]$ is equal to the instantaneous rate of change of the funtion at $s = 1$.

    (a) $\sqrt{2}$
    (b) $\sqrt{3}$
    (c) $\sqrt{5}$
    (d) $\sqrt{6}$
    (e) $\sqrt{12}$

14. The relationship between degrees Celcius, C, and degrees Farenheit, F is

$$F = 32 + \frac{9}{5}C$$

    Suppose you heat water at a constant rate of 9 degrees F per minute. How fast are you heating the water measured in degrees C per minute?

    (a) 1
    (b) 5
    (c) 9
    (d) 5/9
    (e) 9/5

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

$$C(q) = 1000 + q + \frac{1}{10}q^2$$

    The average cost, $A(q)$, equals the total cost divided by the quantity produced. What is the minimum average cost? (Assume $q > 0$)

    (a) 20
    (b) 21
    (c) 26
    (d) 30
    (e) 31

Table for the function 2^x.

x	2^x	x	2^x
0	1.000	.50	1.414
.05	1.035	.55	1.464
.10	1.071	.60	1.516
.15	1.109	.65	1.569
.20	1.148	.70	1.625
.25	1.189	.75	1.682
.30	1.231	.80	1.741
.35	1.274	.85	1.803
.40	1.319	.90	1.866
.45	1.366	.95	1.932