### MA123 Exam 2

March 5 2008

NAME ____________________________ Section __________

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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. For grading use:

Number of problems correct: ________/15

SCORE: ________/100
1. If \( f(x) = \frac{-x^2}{x^2 - 1} \) then \( f'(x) = \)

(a) \( \frac{-x^2 - 1}{(x^2 - 1)^2} \)

(b) \( \frac{1}{x^2} \)

(c) \( \frac{-x^2 - 1}{x^2} \)

(d) \( \frac{x^2 + 1}{x^2 - 1} \)

(e) \( \frac{x^2 + 1}{(x^2 - 1)^2} \)

2. If \( F(s) = \sqrt{2s + 2} \), find \( F'(1) \).

(a) \( \frac{1}{2} \)

(b) \( \frac{1}{2\sqrt{2}} \)

(c) \( \frac{1}{\sqrt{2}} \)

(d) \( \frac{3}{2\sqrt{2}} \)

(e) \( \frac{3}{2} \)

3. If \( g(t) = \frac{1}{t^2 + 1} \), then the slope of the tangent line to the graph of \( g(t) \) at \( t = 3 \) is

(a) \( -\frac{1}{25} \)

(b) \( -\frac{2}{25} \)

(c) \( -\frac{1}{50} \)

(d) \( -\frac{3}{50} \)

(e) \( -\frac{4}{25} \)
4. If \( R(x) = (x - 2)(x^2 - 2)(x^3 - 2) \), find \( R'(2) \).
   
   (a) 0  
   (b) 12  
   (c) 48  
   (d) −8  
   (e) −6

5. Suppose \( f(t) = H(G(t)) \) and \( H(3) = 5, H'(3) = 4, G(2) = 3, \) and \( G'(2) = 7 \). Find \( f'(2) \).
   
   (a) 12  
   (b) 35  
   (c) 28  
   (d) 15  
   (e) 43

6. If \( G(s) = u(s^2) \) and \( u(1) = 10, u'(1) = 4, u(-1) = 7, \) and \( u'(-1) = 2, \) then \( G'(-1) = \)
   
   (a) −20  
   (b) 4  
   (c) 10  
   (d) 2  
   (e) −8
7. Let \( f(x) = |x^2 - 1| + 2 \). Find the minimum of \( f(x) \) on the interval \([-3, 3]\).

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

8. Let \( Q(t) = t^2 \). Find a value \( A \) such that the average rate of change of \( Q(t) \) from 1 to \( A \) equals the instantaneous rate of change of \( Q(t) \) at \( t = 2A \).

   (a) 1  
   (b) \( \frac{1}{3} \)  
   (c) \( \frac{1}{4} \)  
   (d) \( \frac{1}{5} \)  
   (e) Does not exist

9. Suppose the derivative of a function \( g(x) \) is given by \( g'(x) = x^2 - 1 \). Find all intervals on which \( g(x) \) is increasing.

   (a) \((−\infty, \infty)\)  
   (b) \((-1, 1)\)  
   (c) \((−\infty, −1) \text{ and } (1, \infty)\)  
   (d) \((0, \infty)\)  
   (e) \((−\infty, 0)\)
10. Suppose \( f(t) = 2t^3 - 9t^2 + 12t + 31 \). Find the value of \( t \) in the interval \([0, 3]\) where \( f(t) \) takes on its minimum.

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

11. Suppose that \( f(x) = xg(x) \), and for all positive values of \( x \) the function \( g(x) \) is negative (i.e., \( g(x) < 0 \)) and decreasing. Which of the following is true for the function \( f(x) \)?

(a) \( f(x) \) is negative and decreasing for all positive values of \( x \).
(b) \( f(x) \) is positive and increasing for all positive values of \( x \).
(c) \( f(x) \) is negative and increasing for all positive values of \( x \).
(d) \( f(x) \) is positive and decreasing for all positive values of \( x \).
(e) None of the above

12. If \( Q(s) = s^7 + 1 \), find

\[
\lim_{h \to 0} \frac{Q(1 + h) - Q(1)}{h}
\]

(a) 2 
(b) 5 
(c) 6 
(d) 7 
(e) 8
13. Suppose \( f(t) = \frac{F(t)}{t} \) and \( F(1) = 2, \ F'(1) = 6 \). Find \( f'(1) \).

(a) 2  
(b) 4  
(c) 1  
(d) −4  
(e) −1

14. If the line \( y = 9 + 3(x − 4) \) is tangent to the graph of \( G(x) \) at \( x = 4 \) and \( G(x) \) is differentiable at \( x = 4 \), then \( G(4) − G'(4) \) equals

(a) 3  
(b) 4  
(c) 5  
(d) 6  
(e) 9

15. Suppose the derivative of \( H(s) \) is given by \( H'(s) = s^2(s + 1) \). Find the value of \( s \) in the interval \([-100, 100]\) where \( H(s) \) takes on its minimum.

(a) −100  
(b) −1  
(c) 0  
(d) 1  
(e) 100