

MA 125 - 6C, CALCULUS I  
 April 20, 2011

Name (Print last name first): .....

Student Signature: .....

**TEST IV**

**No calculators are allowed!**

**PART I**

**Part I consists of 6 questions. Clearly write your answer (only) in the space provided after each question. You do not need not to show your work for this part of the test. No partial credit is awarded for this part of the test!**

Question 1

Find all the critical numbers of the function  $f(x) = x^3 + 3x^2 - 24$ .

Answer: .....

Question 2

The function  $f(x) = 3x^2 + 2x + 5$  satisfies the hypotheses of the Mean Value Theorem on the interval  $[-1, 1]$ . Find the number  $c$  that satisfies the conclusion of the Mean Value Theorem.

Answer: .....

Question 3

Find the absolute maximum value of the function  $f(x) = 3x^2 - 12x + 4$  on the closed interval  $[0, 3]$ .

Answer: .....

Question 4

Find the open interval(s) on which the function  $g(x) = -x^3 + 27x + 3$  is decreasing.

Answer: .....

Question 5

Find the open interval on which the function  $h(x) = x \ln(x)$  is concave up. (Note that  $x$  must be positive for the function  $h(x)$  to make sense here!)

Answer: .....

Question 6

Find the most general antiderivative of the function  $f(x) = 1 + \cos(x)$ .

Answer: .....



**Problem 2**

Consider the function

$$f(x) = 4 + 3x - x^3.$$

Answer all the following questions.

- (a) Find the (open) interval of increase, and all the (open) intervals of decrease.
  
  
  
  
  
  
  
  
  
  
- (b) Find all local maximum and minimum points. [Be sure to give the  $x$  and  $y$ -coordinates of each point.]
  
  
  
  
  
  
  
  
  
  
- (c) Find the open interval(s) where the function is concave down, and the open interval(s) where it is concave up.
  
  
  
  
  
  
  
  
  
  
- (d) Find the inflection point(s). [Be sure to give the  $x$  and the  $y$ -coordinates!]
  
  
  
  
  
  
  
  
  
  
- (e) Use the information from parts (a)–(d) to sketch the graph.

**Problem 3**

This problem has two separate questions. (Answer all the questions.)

- (1) Find the dimensions of a rectangle with perimeter 16 ft whose area is as large as possible. (Show your work!)

- (2) Find two positive numbers whose product is 25 and whose sum is a minimum. (Show your work!)

**Problem 4**

This problem has two separate questions. (Answer all the questions.)

- (a) Find the most general antiderivative of the function

$$f(x) = 2 + \frac{1}{2}x^{-1/2} + e^x + \frac{1}{1+x^2}.$$

- (b) Find the most general antiderivative of the function

$$f(x) = \frac{4 - 3x^3 + 4x^5}{x^5}.$$

**Problem 5**

An object moves along a vertical line with acceleration  $s''(t) = \sin(t)$  ft/s<sup>2</sup>, and it is known that  $s(0) = 0$  and  $s(\pi) = 0$ . Find the position  $s(t)$  of the object. (Show your work!)

SCRATCH PAPER



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