

MA 125 - 6C, CALCULUS I

February 28, 2011

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

Student Signature: .....

**TEST II**

**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 to show your work for this part of the test. No partial credit is awarded for this part of the test!

Each question is worth 5 points.

Question 1

Differentiate the function  $f(x) = (x + 3) \sin(x)$ .

Answer: .....

Question 2

For what value(s) of  $x$  does the graph of the function  $f(x) = \frac{1}{3}x^3 - \frac{1}{4}x^4 - 6$  have a horizontal tangent line? (You should find two values in all!)

Answer: .....

Question 3

Suppose  $h(x) = f(x)g(x)$  where  $f(1) = 0$ ,  $g(1) = 0$ ,  $f'(1) = -2$  and  $g'(1) = 1$ . Find the numerical value of the derivative  $h'(1)$ . [Your answer should be a number!]

Answer: .....

Question 4

Let  $h(x) = \frac{f(x)}{\cos(x)}$  where  $f(x)$  is a differentiable function on the real line with  $f'(0) = -1$ . Find the numerical value of the derivative  $h'(0)$ . [Your answer should be a number!]

Answer: .....

Question 5

Find the derivative of the function  $f(x) = \sqrt{x^3 - x^2 + 4}$ .

Answer: .....

Question 6

Use implicit differentiation to find  $\frac{dy}{dx}$  if it is known that  $3y^2 - 2x^3 = 1$ .

Answer: .....



**Problem 2**

This problem has two separate questions! Answer each question.

- (a) For which (numerical) values of  $a$  and  $b$  is the line  $y - 2x = b$  tangent to the curve  $y = ax^2$  when  $x = 1$ .

- (b) Differentiate the function

$$y = \frac{x - \cos(x)}{1 + \sin(x)}.$$

(Simplify and write your answer as one single fraction!)

**Problem 3**

(a) Find the derivative of the function

$$g(x) = (x - 1) \sqrt{x^2 - 2}.$$

(Simplify and write your answer as a single expression!)

(b) Find the derivative of the function

$$f(x) = \frac{x - 1}{x + 1}.$$

(Simplify and write your answer as a single fraction!)

**Problem 4**

(a) Find the derivative of the function  $f(x) = \tan(x^3)$ .

(b) Use implicit differentiation to find an equation of the tangent line to the curve

$$x^2 + xy + y^2 = 3$$

at the point  $(1, 1)$ .

**Problem 5**

A car travels south at 40 mi/h and another travels west at 30 mi/h. They are both headed for the intersection of the two roads. At what rate are the cars approaching each other when the first car is 0.3 mi and the second one is 0.4 mi away from the intersection? (Show your work!)

SCRATCH PAPER



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