MA 125-CV, CALCULUS I

February 22, 2007

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

Last Four Digits of Student ID: ....

TEST II

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!

Each question is worth 5 points.

Question 1

Differentiate the function $y = \frac{1}{2}x^6 - 3x^4 + x + 4$.

Answer: .....

Question 2

For what value of x does the parabola $y = 3x^2 - 2x$ have a horizontal tangent?

Answer: .....

Question 3

Suppose $h(x) = f(x)g(x)$ where $f(2) = 3$, $g(2) = 4$, $f'(2) = 2$, and $g'(2) = -6$. Find the numerical value of $h'(2)$.

Answer: .....

Question 4

Let $h(x) = \dfrac{\cos x}{g(x)}$ where $g(0) = 2$, $g'(0) = 8$. Find the numerical value of $h'(0)$.

Answer: .....

Question 5

Let $f(x) = h(g(x))$ where $g'(1) = 5$, $g(1) = -2$, and $h'(-2) = 3$. Use the Chain Rule to find the numerical value of $f'(1)$.

Answer: .....

Question 6

If $x = 4 - y^2$ and $\dfrac{dy}{dt} = 5$, find $\dfrac{dx}{dt}$ when $y = 2$.

Answer: .....

PART II

Each problem is worth 14 points.

Part II consists of 5 problems. You must show your work on this part of the test to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit.

Problem 1

(a) Differentiate the function

$$g(x) = (3x - 2)^3(3 + x^2)^2.$$

(Simplify your answer!)

(b) Differentiate the function

$$y = \frac{\sin x + \cos x}{\cos x}.$$

(Simplify your answer!)

Problem 2

(a) Find the derivative of the function

$$F(z) = \sqrt{\frac{z-1}{z+1}}.$$

(Simplify your answer!)

(b) Find the derivative of the function

$$y = \tan(\sin 2x).$$

Problem 3

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

$$x^2y^2 + 4xy = 12y$$

at the point $(2, 1)$.

(b) Find dy/dx by implicit differentiation when it is known that

$$y^2 + x \sin y = 4.$$

Problem 4

For what (numerical) values of a and b does the parabola $y = ax^2 + bx + 7$ have a tangent line with slope 4 at $x = 1$ and a tangent line with slope -8 at $x = -1$?

Problem 5

A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point $(2, 3)$, the y-coordinate is increasing at a rate of 4 cm/s. How fast is the x-coordinate of the point changing at that instant?