MA 125 - CT, CALCULUS I
September 22, 2011

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

Student Signature: .....

TEST II

No calculators are allowed!

PART I

Part I consists of 10 questions. Clearly write your answer in the space provided after each question. Show your work as much as possible.

Each question in Part I is worth 5 points.

Question 1

Differentiate the function $y = f(x) = (x^2 - 1)(x^2 + 1)$. (Simplify your answer!)

Answer: .....

Question 2

Differentiate the function $y = f(x) = \frac{x^5 - x^2}{x}$. (Simplify your answer!)

Answer: .....

Question 3

Find $f'(x)$ if $y = f(x) = x^2 \cos(x)$.

Answer: .....

Question 4

Differentiate the function $y = f(x) = \frac{x^2+1}{x^2-1}$. **Simplify your answer!**

Answer: .....

Question 5

Differentiate the function $y = f(x) = \tan(x^2)$.

Answer: .....

Question 6

Find $y' = \frac{dy}{dx}$ if $x^5 + y^5 = 5$.

Answer: .....

Question 7

If $A = \pi r^2$ is the area of a round disk of radius r, find $\frac{dA}{dt}$ when $r = 3$ and $\frac{dr}{dt} = 2$.

Answer: .....

Question 8

Find all values x in the domain of the function $y = f(x) = (x^2 - 1)^2$ where the tangent line at the point $(x, f(x))$ is horizontal.

Answer: .....

Question 9

Differentiate the function $y = (3x^2 + x + 1)^5$.

Answer: .....

Question 10

If $S(t) = (t^3 + 1)^2$ is the position of a particle at time t, find the velocity at time $t = 1$.

Answer: .....

PART II

Each problem is worth 10 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

Find the equation of the tangent line to the graph of the function $y = f(x) = (x-2)^3x^5$ at the point with $x = 1$.

Problem 2

Find y' if $x^4 + y^4 = xy$.

Problem 3

Find all x-coordinates of points on the graph of $f(x) = (x-1)^5(x+1)^7$ where the tangent line is horizontal. [Hint: factor the derivative.]

Problem 4

Car A is speeding east away from an intersection at a speed of 100 km/h while a police car is traveling south towards the same intersection at a speed of 140 km/h. How fast is the distance between the two cars changing if car A is 5 km and car B is 12 km from the intersection?

Problem 5

A large conical tank (in the shape of an ice cream cone) has height 10 m and radius 4 m. Since the tank is leaking the height of the water in the tank is dropping at a rate of $2\,m/hr$. At what rate is water leaking out of the tank (i.e., what is the rate of change of the volume) when the height of the water in the tank is 5 m?
The volume V of a conical tank of height h and radius r is $V = \frac{1}{3}\pi r^2 h$.