M E T U
Department of Mathematics

Group	Calculus with Analytic Geometry Midterm I	List No.

Code : *Math 119* Acad. Year : *2009-2010* Semester : *Spring* Date : *April 10th 2010* Time : *13:30* Duration : *110 minutes*	Last Name : Name : Student No. : Department : Section : Signature : 9 QUESTIONS ON 4 PAGES TOTAL 60 POINTS

1	2	3	4	5	6	7	8	9		

SHOW DETAILED WORK IN EVERY PROBLEM.

Question 1 (8 pts.) Find the following limits. Do not use the l'Hospitals rule!

a) $\lim_{x\to\infty} \frac{\sin x - x}{x}$

b) $\lim_{x\to 0} \frac{1-\sqrt{(x^2+1)}}{x^2}$

Question 2 (6 pts.) Find the equation of the tangent line to the curve $x\cos x + \sin y = \frac{1}{2}$ at the point $(\pi/2, \pi/6)$.

Question 3 (6 pts.) Let $y = y(x)$ be a function of x. Find y'' if $x^2 + y^2 + x = 0$.

Question 4 (8 pts.) $f(x) = \begin{cases} mx^3 & x \leq 1 \\ ax + b & x > 1 \end{cases}$ **a)** Find the relation between a, b and m for f to be continuous everywhere.

b) Let f be as above. If $f(2) = 4$ then determine the value of a, b and m for f to be differentiable everywhere.

Question 5 (6 pts.) A point is moving on the curve $x^3 + y^3 - 6xy = 0$. Its x-coordinate is increasing at a rate of 1 ($\frac{dx}{dt} = 1$) at $x = 2$. Find the change in the y-coordinate at that instant.

Question 6 (6 pts.) Using derivatives find the point on the line segment $2x + y = 1$ ($0 \le x \le 1$) that is closest to the point $(3, 1)$.

Question 7 (4 pts.) Evaluate $\frac{d}{dx}(\int_{x^2}^{1} \cos^2 t \, dt)$.

Question 8 (4 pts.) Evaluate the integral $\int_0^{2\pi}(\sin 2x + x^3 - 5)dx$.

Question 9 (12 pts.) Let $f(x)$ be the function given by $\frac{1}{1+x^3}$.

a) Determine the asymptote(s).

b) Determine the intervals of increase and decrease.

c) Determine the concavity and inflection points.

d) Sketch the graph of f.