M E T U
Northern Cyprus Campus

	Calculus and Analytical Geometry **I. Midterm**	
Code : *Math 119* Acad.Year : *2007-2008* Semester : *Fall* Date : *2.11.2007* Time : *17:40* Duration : *120 minutes*	Last Name : Name : Student No : Department: Section: Signature:	
	6 QUESTIONS ON 6 PAGES TOTAL 101 POINTS	

1	2	3	4	5	6		

1. (4+4+4+4=16 points) Evaluate each of the following limits if it exists, or else show why it doesn't exist. (Do not use L'Hospital's rule.)

(a) $\lim\limits_{x\to 6} \dfrac{\sin(x-6)}{x^2-36}$

(b) $\lim\limits_{x\to 1} \dfrac{x^2+2x-3}{x^2-3x+2}$

(c) $\lim\limits_{x\to 0}(x|x| + \dfrac{x}{|x|})$

(d) $\lim\limits_{x\to +\infty}(\sqrt{x^6+5x^3} - x^3)$

2. (a) (10 points) Using the $\epsilon - \delta$ definition of limit, prove that

$$\lim_{x \to 3}(4x - 10) = 2$$

(b) (10 points) Let $f(x) = \begin{cases} \dfrac{1}{x} + mx, & x > 1 \\ \\ x^2 + 3x + k, & x \leq 1 \end{cases}$

Determine the values of the constants k and m so that the function $f(x)$ is differentiable at $x = 1$.

3. (5+5+5=15 points) Evaluate each of the following derivatives. Do not simplify the final expression.

(a) $(\sqrt{x} + \frac{1}{\sqrt{x}} + x - \frac{1}{x})'$

(b) $((x^3 + 1)\cos x)'$

(c) $(\frac{\cos(\sqrt{x-1})}{\sin(\sqrt{x+1})})'$

4. (a) (10 points) Say $f(x) = \dfrac{x^2-1}{x^2+1} g(x)$, $f(0) = -2$, $f'(0) = 1$.

(i) Find $g(0)$.

(ii) Find $g'(0)$.

(iii) Find $(f(x)g(x))'|_{x=0}$.

(iv) Find $(\dfrac{f(x)}{g(x)})'|_{x=0}$.

(b) (10 points) Consider the curve $x^{\frac{3}{4}} + y^{\frac{3}{4}} + xy = 25$.

Find an equation for the tangent line to the curve at $(1, 16)$.

5. (a) (10 points) Estimate $\sqrt[5]{99999}$.

(b) (10 points) The height of a container of right circular cylindrical shape is increasing at a constant rate of $1cm/s$, and the radius of its base is decreasing at a rate of $0.3cm/s$. Find the rate at which its volume is changing when the height of the container is $10cm$ and its base radius is $2cm$.

6. (10 points) If $f(1) = 10$ and $f'(x) \geq 2$ for $1 \leq x \leq 4$, what is the minimum possible value of $f(4)$? Prove your result.