

M E T U

Northern Cyprus Campus

Calculus With Analytic Geometry			
Short Exam 1			
Code : <i>Math 119</i>	Last Name: _____ Name: _____		
Acad. Year: <i>2011-2012</i>	Department: _____ Student No: _____		
Semester : <i>Summer</i>	Section: _____ Signature: _____		
Date : <i>13.7.2012</i>	Recitation: _____		
Time : <i>16:40</i>	4 QUESTIONS ON 2 PAGES		
Duration : <i>30 minutes</i>	TOTAL 50 POINTS		
1	2	3	4

Show your work! No calculators! Please draw a box around your answers!

Please do not write on your desk!

1. (12 pts.) Find the numbers at which $f(x)$ is discontinuous. **Give reasoning.**

$$f(x) = \begin{cases} \sin(x) & \text{if } x < -1 \\ 1/x & \text{if } -1 \leq x < 1 \\ 2-x & \text{if } 1 \leq x < 2 \\ 2x-4 & \text{if } x > 2 \end{cases}$$

$\sin(x)$, $2-x$, $2x-4$ are cont on \mathbb{R} :

$\frac{1}{x}$ is discont at $x=0 \in [-1, 1)$, because it is not defined.

$$\lim_{x \rightarrow -1^-} f(x) = \lim_{x \rightarrow -1^-} \sin x = \sin(-1) \neq \lim_{x \rightarrow -1^+} f(x) = \lim_{x \rightarrow -1^+} \frac{1}{x} = -1 = f(-1)$$

$$\lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1^-} \frac{1}{x} = 1 = \lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^+} 2-x = 1 = f(1)$$

$\lim_{x \rightarrow 2} f(x) = 0$ but f is not defined at $x=2$

So f is discont at $x=0, -1, 2$

2. (12 pts.) Find $f'(1)$ if $f(x) = 3x^3 - 2$, using the limit definition of the derivative only.

(Note : Any other methods will not receive any credit.)

$$f'(1) = \lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h} = \lim_{h \rightarrow 0} \frac{3(1+h)^3 - 2 - 1}{h}$$

$$= \lim_{h \rightarrow 0} \frac{3((1+h)^3 - 1)}{h} = \lim_{h \rightarrow 0} \frac{3(\cancel{1+h-1})(1+h)^2 + (1+h) + 1)}{h}$$

$$= \lim_{h \rightarrow 0} 3((1+h)^2 + h + 2) = 3 \cdot 3 = \boxed{9}$$

3. (10 pts.) Find the tangent line to the graph of $x^2 + 3x^2y^2 + y^2$ at the point (1, 1). = 5

This question is cancelled due to mistyping!

(Using implicit diff: $2x + 6xy^2 + 6x^2yy' + 2yy' = 0$
 at (1, 1) $2 + 6 + 6y' + 2y' = 0 \Rightarrow y'|_{(1,1)} = -1$.
 tangent line: $y - 1 = -1(x - 1) \Rightarrow \boxed{y = 2 - x}$)

4. (16 pts.) Find the following derivatives. **DO NOT SIMPLIFY YOUR ANSWERS.**

(a) $\frac{d}{du} \left(u^e - \frac{1}{\sqrt[5]{u^3}} \right) = eu^{e-1} + \frac{3}{5} \frac{1}{\sqrt[5]{u^8}}$

(b) $\frac{d}{dt} \left(\frac{2t^2 + 6}{t^3 + 3} \right) = \frac{4t(t^3 + 3) - 3t^2(2t^2 + 6)}{(t^3 + 3)^2}$

(c) $\frac{d}{dp} \left((119p + 3)^{2012} \right) = 2012 (119p + 3)^{2011} \cdot 119$

(d) $\frac{d}{dx} \left(\sin(2x) \cos(x^2 + 1) \right) = 2 \cos(2x) \cos(x^2 + 1) - 2x \sin(2x) \sin(x^2 + 1)$