UGANDA MARTYRS UNIVERSITY
NKOZI

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND STATISTICS

SUPPLEMENTARY/SPECIAL EXAMINATIONS

UNIVERSITY EXAMINATIONS
AUGUST 2014

YEAR ONE- ECON, GEN &FM

CALCULUS 1
MTC101

DATE: 8TH AUGUST 2014

TIME: 10:00 - 1:00 PM

DURATION: 3HRS

Instructions:

*i) Attempt **FIVE** Questions*
ii) Write on both sides of the paper but begin a new question on afresh page

1. Define the following:

i) Odd function (2mks)

ii) Even function (2mks)

b) Using the relevant illustrations, determine whether the following functions are odd, even or neither.

i) $f(x) = x^2$ (3mks)

ii) $f(x) = cosx$ (3mks)

iii) $f(x) = x^5 - 2$ (3mks)

c) Use the Sandwich theorem to prove that $\lim_{x\to 0} x^2 \cos\frac{1}{x} = 0$ (7mks)

2. Use the laws of limits to compute the following

i) $\lim_{x\to -1} \frac{x^2-x+1}{2-x}$ (3mks)

ii) $\lim_{x\to 2} \frac{x^3-8}{x-2}$ (4mks)

iii) $\lim_{x\to 0} \frac{\sqrt{(x^2+16)}-4}{x^2}$ (4mks)

b) Sketch the curve $y = x^2 - 4$ (9mks)

3. Use L'Hopital's rule to evaluate the following limits

i) $\lim_{x\to 0} \frac{\sin x}{2x}$ (4marks)

ii) $\lim_{x\to 1} \frac{x^2-3x+2}{x^2-2x+1}$ (4marks)

b.) Find all the critical points and determine whether each represents a maximum or minimum value.

i) $f(x) = x^3-3x^2+3x$ (4mks)

ii) $f(x) = -x^2+4x+2$ (4mks)

iii) $f(x) = x^2(x-4)$ (4mks)

4. Find the integral of (with respect to x) :

i) $2x^3+4$ (2mks)

ii) $\frac{1}{3}x^4 + 5x$ (2mks)

iii) $\int_0^3 9-x^2$ (3mks)

b) Use the laws of differentiation to find the derivative of the following functions

i. $y = 2x^3 cosx$ (3marks)

ii. $y = \sqrt{x}$ (2mks)

iii. $y = \sin(3x + 4)^3$ Hint: Use the chain rule (3mks)

iv. $y = \frac{cosx}{(x^2+4x)}$ (5mks)

5. State the ε-δ definition of the limit L. Hence prove that $\lim_{x\to 3}(13x - 29) = 10$. (7mks)

b) Define the continuity of a function f(x) (3mks)

c) In the following, find the constant **k** that makes the function continuous at the indicated points:

i) $y = \begin{cases} x^k & x \leq 2 \\ 10 - x & x > 2 \end{cases}$ at the point x=2 (5mks)

ii) $y = \begin{cases} (x-k)(x+k), & x \leq 2 \\ kx+5, & x > 2 \end{cases}$ at the point x=2 (5mks)