**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2015/2016**

**SECOND YEAR FIRST SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

**SMA 2101: CALCULUS 1**

**DATE: NOVEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND**

**ANY OTHER TWO QUESTIONS**

**QUESTION ONE: 30 MARKS**

a. Define the following terms:

i. Range of a function. [2 marks]

ii. Polynomial. [2 marks]

iii. Composite function. [1 marks]

b. Evaluate the following:-

i. lim + - 3

x 3 +3  2- 9 [4 marks]

ii. lim x + 2 [3 marks]

-2 + -2

c. Determine the equation of the normal line to the curve defined by

the equation 2(y- )5 -y = 3 at the point (-1,1) [5 marks]

d. Define continuity, hence determine whether the function f ( is

continuous at = 1 where f () = [5 marks]

e. Determine the differential coefficient of = 2 cos2 [3 marks]

f. Given that f(= 5+ 1 and g(= 2 . Express the composite

function fog and gof in their simplest form possible and find

f (g (-2)) and g ( f (3) ) [5 marks]

**QUESTION TWO: 20 MARKS**

a. Find the equation of both lines (normal and tangent) Through

(2, - 2) to the curve y = 2 + [6 marks]

b. Find the derivative function of the following functions:-

i. 2 + 2 y + y2 = 3

ii. y = e coszx

iii y = 3sinx [10 marks]

c. the total sales (in thousands) for a home video game + month after it

was introduced is given by s(t) = 250t2

t2 +100

find S1(20) and interpret your results. [4 marks]

**QUESTION THREE: 20 MARKS**

a. Differentiate y = 2x with respect to [4 marks]

b. The rate of recovery of a patient after x milligrams of a certain drug

is administered obeys the mathematical model

R = 43 - 102 + 9 + 50,

3

determine the value of that gives a maximum rate of recovery,

hence state the maximum R. [10 marks]

c. Differentiate the following functions with respect to

i. y = e2x (x 2/3 + 4 )  [3 marks]

ii. y= cos (82) [3 marks]

-1

**QUESTION FOUR: 20 MARKS**

a. Find dy for the following, x=t2 and y=3t2 + 5 [3 marks]

dx

b. Calculate the values of a b that will make

f(x) = x3 + ax2 + bx have

i. A local maximum at x= -1 and a local minimum at

x=3 [4 marks]

ii. A local maximum at x =4 and a point of inflection at

x=1 [3 marks]

c. a body moves so that its distance (meters) from a fixed point

D at time in seconds is given by

S= (t-1)2 (3t-2). Find,

i. The time when the body passes through D. [3 marks]

ii. The velocity and acceleration at each time. [4 marks]

iii. Maximum velocity. [3marks]

**QUESTION FIVE: 20 MARKS**

a. Find the equation of the normal to the curve y = 4x2 + 2x + 5

at the point (0,2) [4 marks]

b. find dy if y2 =x2 + sin xy [5 marks]

dx

c. water runs into a conical tank at the rate of 9m3/min. The tank stands

point down and has a height of 10m and a base radius of 15m. How fast is the water level rising when the water is 6m deep. [11 marks]