



**RONGO**  
**UNIVERSITY COLLEGE**

*(A Constituent College of Moi University)*

OFFICE OF THE DEPUTY PRINCIPAL- ACADEMICS AND STUDENTS AFFAIRS

**UNIVERSITY EXAMINATIONS**

**2013/2014 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER EXAMINATION**

**FOR**

**THE DEGREE**

**IN**

**BACHELOR OF EDUCATION (ARTS AND SCIENCE) MAIN, TOWN  
AND AWENDO**

**COURSE CODE: MAT 110**

**COURSE TITLE: BASIC CALCULUS I**

**DATE: 25/2/2014**

**TIME: 09:00AM – 12:00PM**

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**INSTRUCTIONS TO CANDIDATES**

- Answer question **ONE** and any other **THREE** questions
- Marks are shown at the end of each question
- Show workings in the answer booklet for award of full marks
- Do not write on the question paper
- Each question should begin on a fresh page
- Read instructions contained in the answer booklet
- Duration is 3 hours.

**PLEASE TURN OVER**

**THIS PAPER CONSISTS (3) PRINTED PAGES**

**QUESTION ONE:**

(a) Define the terms function, domain and range of a function

(3mks)

(b) The function  $f(x)$  is such that

$$f(x) = \frac{1}{x-1}, x \neq 1$$

(i) State the range of  $f(x)$  (2mks)

(ii) Find  $f^{-1}(x)$  of  $f(x)$  (3mks)

(2mk)

(iii) Evaluate  $f(1)$

(c) Evaluate

(i)  $\lim_{x \rightarrow -1} \frac{x^2 - 1}{x - 1}$

(2mks)

(ii)  $\lim_{x \rightarrow 0} \frac{\sin 5x}{3x}$

(3mks)

(d) Use first principle to find  $\frac{dy}{dx}$  of the function  $f(x) = x^2 - 5x + 4$

(4mks)

(e) Find  $\frac{dy}{dx}$  of the function  $xy - y^2 = \cos y$

(3mks)

**QUESTION TWO:**

(a) Find the equation of the tangent to the curve  $x^2 + 2xy - 2y^2 + x = 2$  at the point  $(-4, 1)$

giving your answer in the form  $ay + bx = c$  where  $a$ ,  $b$ , and  $c$  are constants to be

found

(6mks)

(b) Evaluate  $\int_0^1 (x^2 - 1) dx$

(3mks)

(c) Find  $\frac{dy}{dx}$  of the functions

(i)  $y = xe^{2x}$

(3mks)

(ii)  $y = \sin^{-1} 3x$

(4mks)

**QUESTION THREE:**

(a) Calculate the maximum and minimum values of the function

$$f(x) = x^3 - 4x^2 - 3x$$

Stating values of  $x$  at which they occur.

(5mks)

(b) Find  $\frac{dy}{dx}$  in the following cases

(i)  $y = e^{\cos x}$

(ii)  $y = x \ln (x^2 + 1)$

(iii)  $y = a^x$

(4mks)

(5mks)

(2mks)

**QUESTION FOUR:**

(a) Use the first principle  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  to differentiate  $y = \sin x$

(7mks)

(b) (i) Find  $\frac{dy}{dx}$  for the function  $xy + y^2 = 1$

(5mks)

(ii) Find  $\frac{d^2 y}{dx^2}$  if  $x = t - t^2$  and  $y = t - t^3$

(4mks)

**QUESTION FIVE:**

(a) A ball is projected vertically upwards and its height  $h$  in metres above the ground after  $t$  seconds is given by  $h(t) = 25 + 20t - 5t^2$

Calculate (i) the height from which the ball is thrown

(2mks)

(ii) the greatest height,  $h$  metres, the ball reaches

(3mks)

(b) Differentiate

(i)  $y = \frac{x}{x^2+1}$

(4mks)

(ii)  $y = x^2(x+1)^{1/2}$

(4mks)

(c) Approximate  $\sin(29^\circ)$  using small changes given that  $1^\circ = 0.0175$  radians

(3mks)