

**KARATINA UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2014/2015 ACADEMIC YEAR**

**FIRST** YEAR **SUPPLEMENTARY** EXAMINATION

**FOR THE DEGREE OF:**

BACHELOR OF SCIENCE (AST, ACS, SC, BIO, MIC, AEE, ARE, NRS) BACHELOR OF EDUCATION (ED, EDS)

**COURSE CODE: MAT 110**

**COURSE TITLE: CALCULUS I**

**DATE: DECEMBER 2015**  **TIME:**

**INSTRUCTION TO CANDIDATES**

* SEE INSIDE

**SECTION A**

***Answer Question ONE and TWO (Compulsory)***

**QUESTION ONE (17 marks)**

1. Find all the real numbers for which  is undefined. (3 marks)
2. Evaluate the limit of each of the following:
3. . (2 marks)
4. . (2 marks)
5. Differentiate . (4 marks)
6. The height of an object moving vertically is given by 

with in  feet and  in seconds. Find the:

1. Objects velocity at time . (2 marks)
2. Maximum height attained by the object. (2 marks)
3. Let  and . (3 marks)

**QUESTION TWO**

 

1. Use the above graph of  to state the value  for which:
2.  does not exist. (1 mark)
3.  is continous. (1 mark)
4.  has a removable discontinuity. (1 mark)
5. Find for  by first principles. (4 marks)
6. Find as a function of  if ; . (3 marks)
7. Differentiate: . (4 marks)

**SECTION B**

***Answer ANY THREE questions from this section.***

**QUESTION THREE (13 marks)**

1. For ;
2. Identify the critical points of the function. (2 marks)
3. Determine the open intervals on which the function increases

and decreases. (3 marks)

1. Use an appropriate method to find  at the point  given that

 . (4 marks)

1. Determine all the number(s) *c*  which satisfy the conclusion of Rolle’s Theorem

for the function  on . (4 marks)

**QUESTION FOUR (13 marks)**

1. Show that . (3 marks)
2. Find  given . (4 marks)
3. Determine  given . (3 marks)
4. Find the slope of the line tangent to the curve  at the point . (3 marks)

**QUESTION FIVE (13 marks)**

1. (i) Discuss the curve  with respect to concavity, points

 of inflection and local maxima and minima. (5 marks)

(ii) Sketch the curve. (2 marks)

1. Determine if the function  below is continous at the point .

 . (3 marks)

1. A farmer has 2400 ft of fencing and wants to fence off a rectangular field

that borders a straight river. He needs no fence along the river. What are

the dimensions of the field that has the largest area? (3 marks)

**QUESTION SIX (13 marks)**

1. Apply mean value theorem to the function 

on . (4 marks)

1. Evaluate the limit of each of the following
2. . (2 marks)
3.  given that . (3 marks)
4. Find  given that . (2 marks)
5. Find: . (3 marks)

**QUESTION SEVEN (13 marks)**

1. Compute  given that. (3 marks)
2. Use the formal definition of limits to prove that . (3 marks)
3. More Americans are buying organic fruit and vegetables and products made

with organic ingredients. The amount  in billion dollars spent on organic

food  years after 1995 can be approximated by .

1. Estimate the amount that the Americans will spend on organic

food in 2009. (2 marks)

1. Estimate the rate at which spending on organic food was growing

in 2006. (2 marks)

1. Find  given that . (3 marks)