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**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

**UNIVERSITY EXAMINATIONS**

**DEPARTMENT OF MATHEMATICS AND PHYSICS**

**EXAMINATION FOR THE DEGREE OF BACHELOF TECHNOLOGY IN INFORMATION AND COMMUNICATION TECHNOLOGY FIRST YEAR FIRST SEMESTER AMA 4103: CALCULUS I**

**SPECIAL/SUPPLEMENTARY EXAMINATION**

**DATE: AUGUST, 2011 TIME: 2 Hours**

**INSTRUCTIONS: Answer Question ONE and any other TWO**

**QUESTION ONE (30 MARKS)**

1. Define the following terms
2. A Surjective function (2 Marks)
3. A Bijective function (2 Marks)
4. Let  be defined by  find , , 

(3 Marks)

1. Find for the following functions
2.  (4 Marks)
3.  (2 Marks)
4. Evaluate the following limits
5.  (4 Marks)
6.  (3 Marks)
7. Find the derivative of  by the first principles (5 Marks)
8. Evaluate the following integrals  (5Marks)



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**QUESTION TWO (20 MARKS)**

1. Define continuity of a function at a point  (4 Marks)
2. Define in a way that extends  to be continuous at 

(6 Marks)

1. Find the equation of both lines through that are tangents to the curve  (10 Marks)

**QUESTION THREE (20 MARKS)**

1. Let and. Show that  (8 Marks)
2. Given that , , , find the derivative of  at  where  (4 Marks)
3. Find the derivative of the following functions
4.  (4 Marks)

1.  (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. Find the value of  for which the following function is continuous

 (4 Marks)

1. Find the area of the region between the curves  and 

(6 Marks)

1. Find in the following 

(4 Marks)

1. Use differentials and the function  to approximate 

(6 Marks)

**QUESTION FIVE (20 MARKS)**

1. Find for the following 

,  (4 Marks)

1. How fast does the water level drop when a cylindrical tank is drained at the rate of 3 litres/sec? (5 marks)
2. Evaluate . (5 Marks)
3. Find the dimensions of a rectangular computer lab with perimeter 100m whose area is as large as possible. Find this maximum area (6 marks)