**

**Mathematics Methods Unit 3**

# Test 1 - Differentiation

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| **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total Marks:\_\_\_\_\_\_\_\_\_\_** |
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**Task type: Response**

**Time allowed for this task:**  50 minutes, in-class, under test conditions

Calculator Free – 35 minutes

Calculator-assumed - 15 minutes

**Materials required:** Calculator with CAS capability (to be provided by the student)

**Standard items:** Pens (blue/black preferred) , pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

**Special items:**  Drawing instruments, templates, notes on one unfolded sheets of   
A4 paper, and up to three calculators approved for use in the WACE examinations

**Marks available: 48 marks**

**Task weighting: 6%**

**Section One - Calculator Free**

**Question 1** **[3 marks]**

Determine in terms of where and

**Question 2** **[12 marks]**

Determine for each of the following.

1. 

**Question 3** **[4 marks]**

1. Find the gradient of the curve at the point where

**Question 4 [4 marks]**

Consider the function 

1. Calculate .
2. Using your answer to a), the function  and the incremental formula,  
   calculate the approximate value of .

**Question 5 [6 marks]**

Differentiate the following with respect to



**Question 6 [6 marks]**

Find the equation of the tangent to the curve** at

**Section Two – Resources Allowed Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Question 7** **[3 marks]**

Use the quotient rule to show that

**Question 8** **[5 marks]**

Zebra mussels are an invasive species of shellfish recently discovered in some North American waterways. The mussel density, , in shellfish per square metre, observed in a power station water supply pipe days after a colony began, was modelled by the following equation, where is a positive constant:

(a) What was the mussel density in the colony when observations began? (1 mark)

The mussel density was observed to double every eight days.

(b) Determine the value of , rounded to four decimal places. (2 marks)

(c) The water supply pipe was seriously compromised when the mussel density reached 85 thousand shellfish per square metre. After how many days from the commencement of observations did this happen? (2 marks)

**Question 9**  **[5 marks]**

The radius of a sphere is measured as 4 cm with a possible error of 0.05 cm.



Using increments, determine the approximate error for the volume of the sphere.