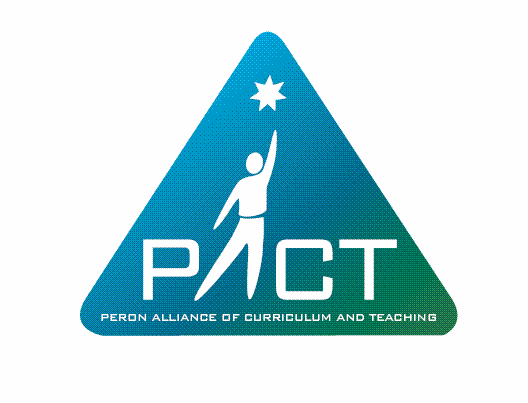
Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: *\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

44

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**METHODS MAT 11**

**Test 5 - 2015**

**Topics: Rates of Change ,Differentiation & Application of Differentiation**

**Total Time:**  *50 minutes*  **Weighting:** *6% of the year.*

***Answers should be rounded to 2 decimal places unless specified****. All working should be shown in the space provided. Solutions without working may not be awarded full marks. Please take the marks for each question into account when answering the question.*

**CALCULATOR FREE**

**Time:** 25 minutes**Equipment Allowed:** Formula sheet

**Marks for Section 1: 20** *marks*

1. (3 marks: 1, 2)

Find: (a) (b)

2. (5 marks: 2, 3)

Differentiate with respect to x:

1. (b)

3. (3 marks)

If , find the value of given that

4. (4 marks)

Determine, using calculus, the coordinates on the curve where

the gradient is 0.

5. (5 marks)

From first principles, find the gradient of the function at the point .

**~ END OF SECTION 1 ~**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SECTION 2: CALCULATOR ASSUMED**

**Time:** *35 minutes* **Equipment Allowed:** Formula sheet, *1 page of notes (A4), CAS and scientific calculators*

**Marks for Section 2: 24** *marks*

6. (2 marks)

Find

7. (3 marks)

Find the average rate of change for the expression from

to

8.(3 marks)

Find the gradient of the curve at the point where

9. (4 marks)

Find the equation of the tangent to at

10. (4 marks)

Find the coordinates of any point on the curve where the gradient is 5

11. (8 marks: 1, 1, 2, 2, 2)

A colony of bacteria is increasing in such a way that the number of bacteria present

after t hours is given by N where . Find

(a) the number of bacteria present initially

(b) the number of bacteria present when t= 5

(c) the average rate of increase, in bacteria/hour, in the first 5 hours

(d) Determine an expression for the instantaneous rate of change of bacteria.

(e) the rate the colony is increasing, in bacteria/hour, when t= 10

**~ END OF SECTION 1 ~**