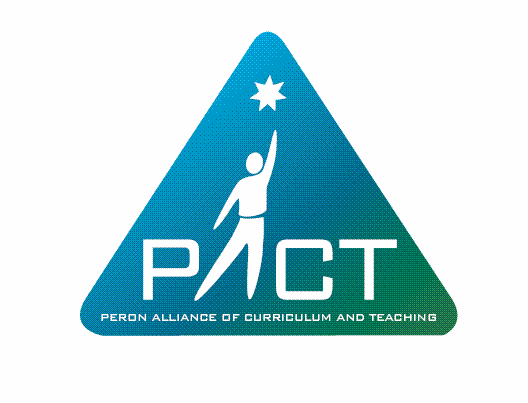
Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: *\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

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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:** 45 minutes**Equipment Allowed:** Formula sheet

1. (5 marks:1,2,2 )

Find: (a) (b)

(c)

2. (5 marks: 2,3)

Differentiate with respect to x:

(a) y = x5 – x3 +7x +2 (b) y=

2. (5 marks)

From first principles, find the gradient of the function f(x) = 3x2 at the point (-1,3).

4. (3 marks)

If f(x) = 3x2 – 4x, find the value of a given that f **ꞌ**(a)=5

5. (2 marks)

Find the average rate of change for the expression f(x)= x2 -6x +10 from x = 4 to x=4.1

6. (5 marks: 1,1,1,2)

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

after t hours is given by N where N = 120 + 500t + 10t3. 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) the rate the colony is increasing, in bacteria/hour, when t= 10

7.(3 marks)

Find the gradient of the curve y= 2x3 +5 at the point where y=3

8. (3 marks)

Determine, using calculus, the coordinates on the curve y= 2x3 -3x2 +4 where

the gradient is 0.

9. (9 marks:3,3,3)

A piece of wire, 300cm long, is used to make the 12 edges of the frame of a rectangular box. The length *(L)* of the rectangular frame is 3 times the width *(x)* of the frame.

1. Show that the height of the rectangular box is given by: .
2. Show that the volume, *V*, of the box is given by .
3. Find the width of the frame that will maximise the volume of the box and find this maximum volume.