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**MATHEMATICS  
Methods Units 1 & 2**

**Test 7 – Differentiation**

**Chapter 8**

**Semester 2 2019**

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**Section Two - Calculator Assumed**

Time allowed for this section

Working time for this section: 30 minutes

Marks available: 31 marks

## Material required/recommended for this section

##### To be provided by the supervisor

This Question/Answer booklet

Formula sheet

##### To be provided by the students

Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters

Special items: drawing instruments, templates, notes on one unfolded sheet of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this course.

## Important note to students

No other items may be used in this section of the assessment. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the assessment room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

1. (9 marks)
2. On the axes below, sketch the graph of y = x3 – 5x2 + 2x – 3 [3]

A close up of a piece of paper

Description automatically generated

1. Show all of the x-intercepts and y-intercepts on the graph above. [2]
2. Find  [2]
3. For what values of x does the tangent to y = x3 – 5x2 + 2x – 3 have a negative slope? [2]
4. (3 marks)

Given  determine:

1.  [1]
2.  [1]
3.  [1]
4. (3 marks)  
   The volume of water flowing through a pipe is given by  , where *V* is the volume in litres and *t* is the time in minutes. Find the rate of water flow after 7 minutes.
5. (8 marks)

Miss Bennett is organizing the Year 12 Awards Night. She believes that if the tickets are priced at $80 each she will be able to sell 500 tickets. For each $5 increase in the price of each ticket, she expects the sales to decrease by 10 tickets.

1. Find the number of tickets she expects to sell if the price of each ticket is increased by x lots of $5. [1]
2. Find the expected revenue when the price for each ticket is raised by x lots of $5. [1]
3. Use calculus, including the sign test, to find the price per ticket that will maximize the revenue. State the maximum revenue. [6]
4. (8 marks)

A rectangular box with a square base is to be made with a volume of 1500cm3.

Let *x* cm be the length of each side of the square base and *h* cm be the height of the box as shown in the diagram.

* 1. **Show** that the formula for the surface area is [4]



1. **Use calculus** to determine the value of *x*, correct to 1 decimal place, that will minimise the surface area. [4]

**End of Test**