CARLINGFORD HIGH SCHOOL

DEPARTMENT OF MATHEMATICS

Year 12 Mathematics

HSC Assessment Task 2 -Term 1 2019

Time allowed: 50 minutes

Student Number:_____

Instructions:

- All questions should be attempted.
- Show ALL necessary working.
- Marks may not be awarded for careless or badly arranged work.
- Only board-approved calculators may be used.
- Use your own paper and write on one side only.
- Workbook and notes may be used (no textbooks)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	
Series Applications									/13
Calculus Applications									/24
Total									/37

YEAR 12 MATHEMATICS ADVANCED

1. Jenny is learning how to drive. Her first lesson is 30 minutes long. Her second lesson is 35 minutes long. Each subsequent lesson is 5 minutes longer than the lesson before.

   (i) How long will Jenny's twenty first lesson be? [2]

   (ii) How many hours of lessons will Jenny have completed after her twenty-first lesson? [2]

2. Ben decided to invest \$800 at the start of each year into a superannuation fund. The interest is compounded at a rate of 10% per annum on the amounts invested. The first \$800 was invested at the beginning of 2001 and the last is to be invested at the beginning of 2030.
   Calculate to the nearest dollar:

   (i) The amount to which the 2001 investment of \$800 will have grown in 30 years. [1]

   (ii) The amount to which the total investment will have grown by the beginning of 2031. [3]

3. Chris borrows \$100 000. He is charged interest each month at a rate of 6% per annum. Chris pays fixed monthly payments of $\$M$. The balance owing after the first monthly payment is $\$(100\,500-M)$.

   (i) Develop a formula for the amount, $\$A_n$ after n monthly payments. [2]

   (ii) Chris chooses 12 years (144 payments) to pay off the loan.
   Find the value of M. [3]

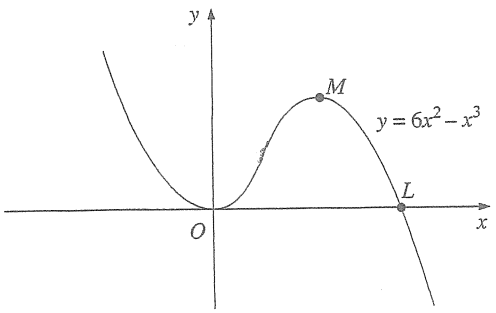
4.

   (i) Find the x value of the stationary points on the continuous curve $y = f(x)$, if $\frac{dy}{dx} = (x-1)^2(x-2)$ [1]

   (ii) Determine their nature. [2]

   (iii) Sketch the curve [1]

5.



The diagram shows a sketch of the curve $y = 6x^2 - x^3$.

The curve cuts the x $axis$ at L, and has a local maximum at M.

(i) Find the coordinates of L [2]

(ii) Find the coordinates of M [2]

6. For the curve $y = x^3 - 6x^2 + 9x - 4$, find the:

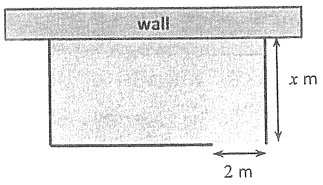
(i) Maximum and minimum turning points [3]

(ii) Point of inflexion [2]

(iii) Absolute maximum value, if x is restricted to the domain $0 \leq x \leq 5$ [1]

(iv) Sketch the curve showing the main features. [2]

7. A farmer has 100 metres of fencing to make a rectangular enclosure for sheep. He will use an existing wall for one side of the enclosure and leave an opening of 2metres for a gate.



(i) Show the area of the enclosure is given by: $A = 102x - 2x^2$ [2]

(ii) Find the value of x that will give the maximum possible area. [2]

(iii) Calculate the maximum possible area. [1]

8. An aircraft window consists of a central rectangle and two semi-circular ends as shown in the sketch.
A window is required to have an area of $1m^2$.
Find the height of the window with the smallest possible perimeter.
(Draw the diagram on your working paper) [3]