Unit 3

Semester 1 2019

Mathematics Methods Test 1

**Applications of differentiation**

**Name** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Total time allowed: 55 minutes. Total marks: 57 marks**

**Section One: Calculator Assumed**

Time allowed for this section: 26 minutes

Total marks for this section: 26 marks

**Materials allowed for this section:**

SCSA Formula Sheet (provided)

Up to 3 SCSA Approved Calculators

**Instructions to candidates**

Show all of your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

5. [2, 1, 2, 2 = 7 marks]

Items being sold for $50 each have a production cost function

dollars for producing *x* items.

1. Find an expression for the profit, corresponding to the manufacture and sale of *x*  items.
2. Determine an expression for (x)
3. Calculate (100) and interpret this value.
4. Find the number of items manufactured and sold which will give the maximum profit.

6. [4 marks]

On the axes below sketch. Clearly indicate each graph.

|  |
| --- |
| f ’(x) |
| f ’’(x) |

(b) The approximate solution to f(x)=0 is \_\_\_\_\_\_\_\_\_\_

7. [2, 2, 4 ,3 = 11 marks]

An isosceles triangle has a perimeter of 60 metres. By letting the length of the congruent sides be x metres:

(a) show that the perpendicular height of the triangle is metres. (A diagram would be useful.)

(b) Show that the area of the triangle 

(c) Show that A’(x) is 

(d) Using your calculator or otherwise, find and verify the value of x that maximises the area.

1. [4 marks]

The radius of a solid rubber wheel of an old wheelbarrow has decreased by 5% after years of wear. Use the method of small changes to approximate the percentage decrease in the volume of rubber in the wheel.