NAME

**Esperance Senior High School**

**Mathematics Methods U3/4 Test 1 – 2018**

**Resource Free**

Reading Time: 2 minutes

Working Time: 38 minutes

Marks: 38

Mathematics Methods Formula Sheet allowed

**Question 1 (10 marks)**

Differentiate the following with respect to x. Do not simplify. (Except negative indices)

(a)  (1 mark)

(b)  (3 marks)

(c)  (3 marks)

(d) . (3 marks)

**Question 2 (4 marks)**

Using the chain rule find  (in terms of m) given that 

**Question 3 (8 marks)**

|  |  |
| --- | --- |
|  | At each indicated point on the diagram state whether it is a local maximum or minimum or a point of inflection or some other significant point. Also indicate what you know about at each point. |

A B C D

**Question 4 (5 marks)**

The displacement of a body x metres from an origin at time t seconds is given by x =  Find

(a) the initial velocity of the body (2 marks)

(b) The acceleration of the body when its velocity is zero. (3 marks)

**Question 5 (5 marks)**

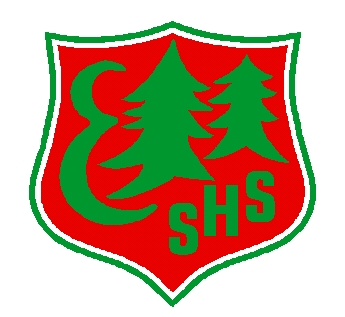
If find the approximate percentage change in y when x increases by 1%

Question 6 (6 marks)

Consider the function defined by , .

(a) Determine the coordinates of the stationary point of . (3 marks)

(b) Use the second derivative test to determine the nature of the stationary point found in (a). (3 marks)

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**Mathematics Methods U3/4 Test 1 – 2018**

**Resource Rich**

Reading Time: 2 minutes

Working Time: 23 minutes

Marks: 23

Mathematics Methods Formula Sheet allowed and 1 Page of notes allowed

**Question 1 (4 marks)**

On the one set of axes below sketch. Clearly indicate each graph.

|  |
| --- |
|  |
|  |

Question 2 (5 marks)

The area of a segment with central angle  in a circle of radius r is given by . Use the increments formula to approximate the increase in area of a segment in a circle of radius 10 cm as the central angle increases from  to .

**Question 3 (9 marks)**

Amatil is planning a medium sized coke can with a volume of 250mL. Find the dimensions of the can to minimise the cost of manufacture (excluding the contents). NB 

(a) Find an expression for h (1 mark)

(b) Show that the surface area (2 marks)

(c) Find an expression for A’(r) (2 marks)

(d) Using your calculator or otherwise, find and verify the values of r and h that minimises the cost of manufacture. (4 marks)

Question 4 (5 marks)

A recent news report said that it took 34 months for the population of Australia to increase from 23 to 24 million people.

(a) Assuming that the rate of growth of the population can be modelled by the equation , where P is the population of Australia at time t months, determine the value of the constant k. (3 marks)

(b) Assuming the current rate of growth continues, how long will it take for the population to increase from 24 million to 25 million people? (2 marks)