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| EGC_Black | Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Eastern Goldfields College**  Mathematics Methods Unit 1 & 2 2017  **Test 511– Calculator Free Section** |

**Time Allowed: 32 minutes Total Marks:38**

1. **[3 marks -1, 2]**

The table shows the temperature of a liquid over a period of time.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time(minutes) | 0 | 5 | 10 | 15 | 20 | 25 |
| Temperature(°C) | 58 | 44 | 32 | 25 | 21 | 19 |

Determine the average rate of change of temperature of the liquid

1. over the first ten minutes
2. between 15 and 20 minutes
3. **[4 marks – 1, 1, 1, 1]**

Consider the graph of the function y = f(x). Use the features of this graph to answer the following questions.

1. List the points where the gradient is negative



1. State the points of inflection.
2. List the points where is zero.
3. One point of infection has not been marked on the diagram – find it and label it J
4. **[13 marks - 2, 2, 2, 2, 3, 2]**

Differentiate each of the following with respect to ‘x’.

Write answers with positive indices and do obvious simplification

(a) y = x5 + 4x2 – 8x + 3 (b) g(x) = 

(c) f(x) = (8 – x)(5x2 + 7) (d) y = (3 – 5x)2

(e) y =  (f) y = 

**4. [4 marks -1, 3 ]**

Given that f(t) = 4t3 – 2t, find:

a) f ‘ (t)

b) Hence, or otherwise, find when f ‘ (t) = 1

**5. [2 marks]**

State one function whose derivative is **2x – 1**.

**6. [4 marks]**

Find the equation of the tangent line to the curve **y = 2x3 – x2 + 6** at the point **(-1,3)**.

**7. [5 marks]**

y = 2x + 1 is a tangent to the curve y = ax3 + bx, at the point (1, 3). Find the values of a and b.

**8. [3 marks]**

Differentiate from first principles

|  |  |
| --- | --- |
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**Time Allowed: 35 minutes Total Marks:30**

**9. [5 marks – 4, 1]**

1. Determine the rules for the lines that are tangent to the curve y = x2 – 5x – 24 where it crosses the x –axis.
2. Find where these tangent lines meet.

**10. [4 marks - 2,2]**

a) Insert four evenly spaced numbers between 8 and 36.

b) Insert three numbers between 4 and 2500 so that they are in geometric progression.

**11. [4 marks]**

Find the sum of all powers of 2 between 500 and 50000.

**12. [9 marks – 3, 2, 2, 2]**

A toy train is moving around a circular track of radius 1.5 m and during the first minute completes 9.5 laps of the track. In each subsequent minute, as the batteries run down, the train travels 90% of the distance travelled in the previous minute.

1. Determine the distance travelled by the train during the fifth minute.

(b) During which minute does the train first travel less than one complete lap of the circuit?

1. Determine the time, to the nearest minute, that the train takes to travel a distance of at least 500

metres.

1. Show that the train will never complete more than 95 laps of the circuit.

**13. [8 marks – 4, 4]**

The first three terms of a sequence are, in order, .

1. Determine the value of x and the sixth term of the sequence if the sequence is an arithmetic

progression.

1. Determine the value of x and the sum of the first ten terms of the sequence if the sequence is a

geometric progression with a positive common ratio.