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| EGC_Black | **Eastern Goldfields College**  ***Year 12 MATHEMATICS METHODS***  ***TEST 1 2017*** |

CALCULATOR FREE

**Total Marks: 27**

**Reading: 2 minutes Time Allowed: 30 minutes**

1. [ 4 marks ]

A function *y* = *f* (*x*) is such that 

The function has a maximum point at (1, 3).

Determine the values of *a* and *b*.

2. [4 marks]

If the radius of a sphere is measured with an error of at most 4%, estimate the percentage error in the volume of the sphere.

3. [ 12 marks ]

Determine the gradient function ****for each of the following.

Leave your answers with positive indices, where necessary. Do not simplify.

(a)  (Where *a* is a positive constant) [1]

(b)  [2]

(c)  [3]

(d) y = [3 + cos(x/2)]4 [3]

(e)  [3]

4. [ 7 marks ]



(a) Evaluate:

(i) *f* (2) [1]

(ii) *f*  ′(2) [1]

(iii) *f*  ′′(2) [1]

(b) (i) Sketch the graph of *f* (*x*) over the domain  on the axes provided. [1]



(ii) With reference to your sketch, explain the significance of each answer

from part (a). [3]

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CALCULATOR ASSUMED

**Total Marks: 19**

**Reading: 2 minutes Time Allowed: 22 minutes**

5. [ 4 marks ]

A spherical balloon is being inflated by pumping gas into it at a rate of 5 m3/minute.

Determine the rate at which the diameter is increasing when the radius is 1 m. [4]

6. [ 4 marks ]

A population, *y*, increases according to the differential equation:



The population at the start of 2000 has size 1 000.

(a) State the equation for population, *y*, in terms of *t*. [1]

(b) State the population size when *t* = 5. [1]

(c) Determine the doubling time for the population. [2]

7. [ 11 marks ]

The function has a global minimum value over the domain .

(a) Complete the following table. [2]

|  |  |
| --- | --- |
| *x* |  |
| 0.5 |  |
| 0.6 |  |
| 0.7 |  |
| 0.8 |  |

(b) Explain why the table shows that a local minimum exists in the domain. [1]

(c) Sketch the graph of *y* = *h* (*x*) over the domain given on the axes provided, labelling

clearly any important points. [2]



(d) State the minimum value of *h* (*x*), correct to three decimal places, over the

stated domain. [1]

***Question 7 continued***

(e) Use your calculator to determine the derivative *h* ′(*x*), giving your answer in fractional

form, and with positive indices. [1]

(f) Explain how to use the derivative *h* ′(*x*) and your calculator to determine any stationary

point of *h* (*x*)*.* State the *x* value of any stationary point. [2]

(g) Use the “Sign Test”, by completing the following table, to prove that the stationary

point found in (f) is a local minimum. [1]

|  |  |  |  |
| --- | --- | --- | --- |
| *x* |  |  |  |
| *h* ′(*x*) |  |  |  |

(h) State the nature of concavity of *h* (*x*). [1]