

2017 TRIAL EXAMINATION 1

UNITS 3&4

###### STUDENT NAME

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**MATHEMATICAL METHODS**

**Written examination 1**

**2017**

**Reading time: 15 minutes**

**Writing time: 1 hour**

**QUESTION AND ANSWER BOOK**

**Structure of book**

|  |  |  |
| --- | --- | --- |
| *Number of*  *questions* | *Number of questions*  *to be answered* | *Number of*  *marks* |
| 9 | 9 | 40 |

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

* Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers.
* Students are NOT permitted to bring into the examination room: any technology (calculators or

software), notes of any kind, blank sheets of paper and/or correction fluid/tape.

**Materials supplied**

* Question and answer book of 14 pages.
* Working space is provided throughout the book.

**Instructions**

* Write your **name** in the space provided above on this page.
* Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
* All written responses must be in English.

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**Instructions**

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given, unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

**Question 1** (4 marks)

**a.** Let *y* = cos(*x*2 – 2). Write an expression for . 1 mark

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**b.** Consider the function *f* (*x*) = *x*log*e*(2*x* – 5).

**i.** Determine *f* ′(*x*). 2 marks

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**ii.** Calculate *f* ′(3). 1 mark

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**TURN OVER**

Working space

**Question 2** (5 marks)

Let *f* ′(*x*) = .

**a.** Calculate *f* (*x*) if *f* (2) = 1. 3 marks

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**b.** Calculate . 2 marks

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**TURN OVER**

**Question 3** (6 marks)

Consider the function *f* : *D* → *R* with rule .

**a.** State the domain *D* and the range of *f* (*x*). 2 marks

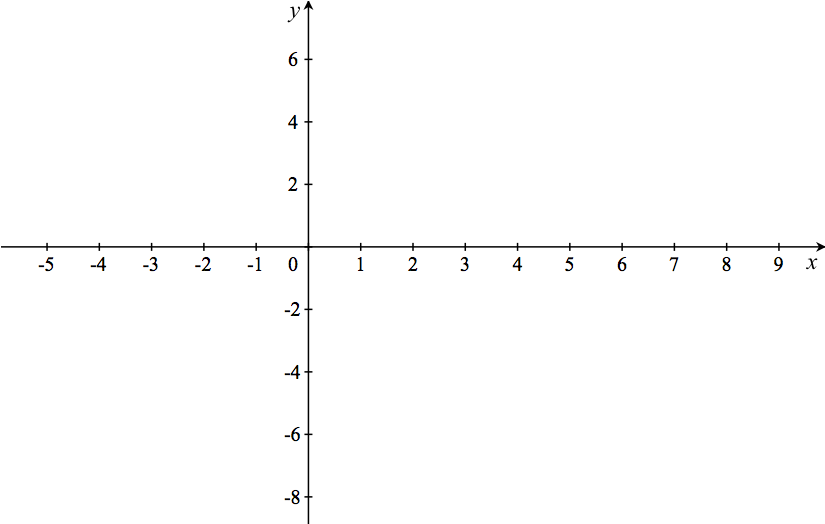
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**b.** On the set of axes below sketch the graph of *f* (*x*) clearly labelling all key features including all axes

intercepts and any possible asymptotes. 2 marks



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**c.** Calculate the average value of the function *f* (*x*) over the interval 3 ≤ *x* ≤ *e* + 2. 2 marks

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**TURN OVER**

**Question 4** (3 marks)

Solve the equation 2log*e*(2*x*) − log*e*(2*x* – 1) = log*e*(3*x* + 1) for *x*.

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**Question 5** (3 marks)

Solve the equation 4sin3(*x*) = 3sin(*x*) for .

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**TURN OVER**

**Question 6** (6 marks)

A telemarketer makes phone calls to companies to sell advertising space. The discrete random variable *X* represents the number of sales the telemarketer makes per day.

The probability distribution of the random variable *X* is shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *x* | 0 | 1 | 2 | 3 |
| Pr(*X* = *x*) | 0.2*a* | 0.3 | *a* | 0.1 |

**a.** Show that *a* = 0.5. 1 mark

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**b.** Calculate the expected value of *X*. 2 marks

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**c.** Calculate the probability that the telemarketer sells at most one advertising space per day in any

given day. 1 mark

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**d.** Calculate the probability that the telemarketer sells more than 2 advertising spaces per day for two

consecutive days. 2 marks

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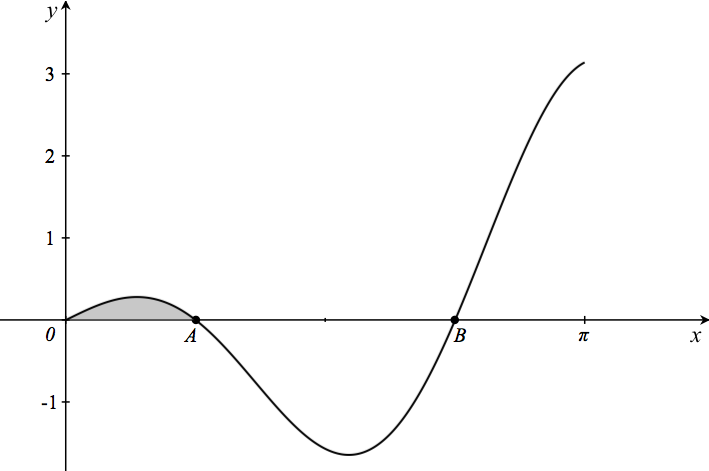
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**Question 7** (5 marks)

The graph shown below represents part of the curve *y* = *x*cos(2*x*), for *x* ∈ [0, *π*].



**a.** From the graph above, state the *x* – coordinate of point *A*. 1 mark

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**b.** Determine an expression for the derivative of *x*sin(2*x*). 1 mark

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**TURN OVER**

**c.** Calculate the area of the shaded region under the curve using the answer from **part b**. 3 marks

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**Question 8** (4 marks)

The probability distribution of a continuous random variable, *X*, is given below.



where *k* is a positive constant.

**a.** Show that the value of *k* is . 2 marks

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**b.** Show that the median, *m*, of the variable *X* is greater than . 2 marks

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**TURN OVER**

**Question 9** (4 marks)

Dain is a market researcher and has drawn a random sample of 200 people from a large population. He found that 175 of the people in the sample were right-handed and the rest were left-handed.

**a.** What is the proportion of left-handed people in the sample? 1 mark

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**b.** Calculate the standard error for this estimate. Give your answer in rationalised exact form. 2 marks

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**c.** If the *z* – score for a 95% confidence interval is *z* = 1.96, then state the 95% confidence interval.

(Do **not** simplify your answer). 1 mark

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**END OF QUESTION AND ANSWER BOOK**

