TSSM™
Creating VCE Success

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'2016 Examination Package' -
Trial Examination 3 of 5

STUDENT NUMBER

									Letter
Figures									
Words									

MATHEMATICAL METHODS

Units 3 & 4 – Written examination 1

*(*TSSM's *2013 trial exam updated for the current study design)*

Reading time: 15 minutes
Writing time: 1 hour

QUESTION & ANSWER BOOK

Structure of book

Number of questions	*Number of questions to be answered*	*Number of marks*
8	8	40
		Total 40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers
- Students are NOT permitted to bring into the examination room: notes of any kind, blank sheets of paper, white out liquid/tape or a calculator of any type.

Materials supplied

- Question and answer book of 9 pages.
- Working space is provided throughout the book.

Instructions

- Print your name in the space provided on the top of this page.
- All written responses must be in English.

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

Instructions

Answer **all** questions in the spaces provided.
A decimal approximation will not be accepted if an exact answer is required to a question.
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

Let $f(x) = ke^x - 1 + ke^{-x}$

a. For what value(s) of k will the equation $f(x) = 1$ have two solutions?

2 marks

b. Find the solution(s) to the equation $f(x) = 1$ in terms of k.

2 marks

Total 4 marks

Question 2

Consider $f(x) = 2x\sqrt{1-x}$

a. Find $f'(x)$.

2 marks

b. Hence, find the area between the curve $y = \frac{x}{\sqrt{1-x}}$, the x-axis and the lines $x = -2$ and $x = 0$.

3 marks

Total 5 marks

TURN OVER

Question 3

Consider the function $g(x) = \sin(x) + \cos(x)$

a. Find the general solution for the equation $g(2x) = 0$.

2 marks

b. Hence, find all solutions to the equation $g(2x)=0$ $for\ x \in (-\pi, \pi)$.

2 marks

Total 4 marks

Question 4

a. Find the image, $g(x)$, of the equation $f(x) = \frac{1}{2x}$ under the matrix transformation $T = \begin{bmatrix} 2 & 0 \\ 0 & -3 \end{bmatrix}$.

3 marks

b. State the transformations made to the function $f(x)$ to obtain $g(x)$.

2 marks

c. Find the inverse, $g^{-1}(x)$, of the transformed function $g(x)$.

3 marks

d. State the domain and range of $g^{-1}(x)$.

2 marks

Total 10 marks

TURN OVER

Question 5
A random variable X has probability density function given by

$$f(x) = \begin{cases} 0.3p, & 0 \le x \le 4 \\ xp, & 4 \le x \le 5 \\ 0, & elsewhere \end{cases}$$

a. Find the exact value of p.

3 marks

b. Find the exact value of $\Pr(1 < x < 2.5)$.

2 marks

Total 5 marks

Question 6

An approximate 95% confidence interval for the population proportion is given by the interval (r, s).

a. Find an expression for the sample proportion $\hat{p}$ in terms of *r* and *s*.

_____

_____

_____

2 marks

b. Find an expression for the margin of error for this confidence interval in terms of *r* and *s*.

_____

_____

_____

2 marks

Total 4 marks

TURN OVER

Question 7

Find the equation of the tangent(s) to the curve $y = -x^2 - 8x$ such that the tangent(s) cross the y axis at (0,3).

4 marks

Question 8

Consider the function $f(x) = \sin\left(\frac{4x}{3}\right)$

a. Find the value of $\int_0^{\frac{\pi}{8}} f(x)dx$.

2 marks

b. Find the average value of $f(x)$ over the interval $\left[0, \frac{\pi}{4}\right]$.

_____

_____

_____

2 marks

Total 4 marks

END OF QUESTION AND ANSWER BOOK