TSSM ™
Creating VCE Success

'2016 Examination Package' -
Trial Examination 1 of 5

STUDENT NUMBER

Letter

Figures

Words

MATHEMATICAL METHODS
Units 3 & 4 – Written examination 1

(TSSM's 2011 trial exam updated for the current study design)

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
		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.

Question 1

a. Differentiate $f(x) = \log_e(2 - x)^4$ with respect to x.

2 marks

b. Evaluate $f^{-1}(0)$ where f^{-1} is the inverse function of f.

3 marks

c. For $g(x) = x^2 e^{\sin(x)}$, find $g'\left(\frac{\pi}{2}\right)$.

2 marks

Question 2

a. Find an anti-derivative of $\sqrt{x} - 2\sin\left(\frac{\pi x}{4}\right)$ with respect to x.

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2 marks

b. Find m given that $\int_0^2 (2x - 1)^3 \, dx = e^{\log_e m}$

_____

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2 marks

TURN OVER

Question 3

a. Write down the amplitude and the period of the function $f: R \rightarrow R, f(x) = -3 \cos\left(\frac{\pi - x}{5}\right)$.

_____

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2 marks

b. Solve the equation $-\cos(2x) = \sin(2x)$ for $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.

_____

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3 marks

c. Sketch the graph of $y = \tan(2x)$ for $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, showing the exact values of the axial intercepts and asymptotes.

2 marks

Question 4

The transformations $T: R^2 \rightarrow R^2$ is defined by $\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} -4 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 3 \\ -1 \end{bmatrix}$. The image of the curve $y = 2\log_e(4x) + 1$ under the transformation T has equation $y = a\log_e(bx + c) + d$. Find the values of $a, b, c,$ and d.

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4 marks

Question 5

Find the equation of the tangent line(s) to $h(x) = \frac{1}{(x-2)^2} - 1$ at the point(s) when the graph crosses the x axis.

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3 marks

TURN OVER

Question 6

A sample of n people were asked whether they thought Australia's gun control laws were adequate, 18% said no.

a. What is the value of the sample proportion, $\hat{p}$?

_____

<div align="right">1 mark</div>

b. Find an expression for M, the margin or error for this estimate at the 95% confidence level, in terms of n.

_____

_____

<div align="right">1 mark</div>

c. If the number of people in the sample were halved, what would be the effect on M?

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_____

_____

<div align="right">2 marks</div>
<div align="right">Total 4 marks</div>

Question 7

The continuous random variable X has a distribution with probability density function given by

$$f(x) = \begin{cases} m\cos(x) & x \in \left[\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right] \\ 0 & \text{elsewhere} \end{cases}$$

where m is a constant, find

a. the value of m.

3 marks

b. $Pr(X > \pi)$

2 marks

TURN OVER

Question 8

Let X be a normally distributed random variable with mean 11 and variance 4 and let Z be the random variable with the standard normal distribution. Find

a. $Pr(X < 7)$

1 mark

b. m such that $Pr(X < 8) = Pr(Z > m)$

2 marks

Question 9

a.   Show that $\frac{3-2x}{x+2} = \frac{7}{x+2} - 2$

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_____

_____

2 marks

b.   Hence, find $\int \frac{3-2x}{x+2}\,dx$.

_____

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_____

1 mark

END OF QUESTION AND ANSWER BOOK