TSSM
Creating VCE Success

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2010 Trial Examination

STUDENT NUMBER

									Letter
Figures									
Words									

MATHEMATICAL METHODS (CAS)

Units 3 & 4 – Written examination 1

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*
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 8 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

a. Let $y = e^{-2x}\sin(3x - 1)$. Find $\frac{dy}{dx}$.

2 marks

b. Let $f(x) = \frac{e^{3x}}{x}$. Evaluate $f'(1)$.

3 marks

Question 2

a. Find an anti-derivative of $e^{3\pi x-1}$ with respect to x.

2 marks

b. If $\int_m^4 \frac{3}{9-2x}\,dx = 1$, find m for $m < 4$.

3 marks

TURN OVER

Question 3

Consider the transformations $T: R^2 \rightarrow R^2$ of the plane defined by $\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} 2 & 0 \\ 0 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$.

a. Describe the type of transformation.

_____

_____

_____

2 marks

b. Find the image, y', of the curve with equation $y = \cos(x)$ under T.

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2 marks

c. Solve the equation $y' = 0$ for $-\pi \leq x' \leq \pi$.

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3 marks

d. Hence, sketch the graph of y' against x' for $-\pi \leq x' \leq \pi$, showing all axial intercepts.

2 marks

Question 4

Sand is flowing into an hourglass at a rate of 8 m^3 per minute and forms a right circular cone which has a height equal to three times its radius.

Find the exact rate at which the height of the pile is increasing when the height is 2 m.

3 marks

TURN OVER

Question 5

Let $f: R\backslash\{1\} \to R$ where $f(x) = \frac{1}{(x-1)^2} + 2$.

a. Find the maximal domain for which $f(x)$ is a one-one function and $x > 1$.

1 mark

b. Hence, find f^{-1}, the inverse function of f for this maximal domain.

3 marks

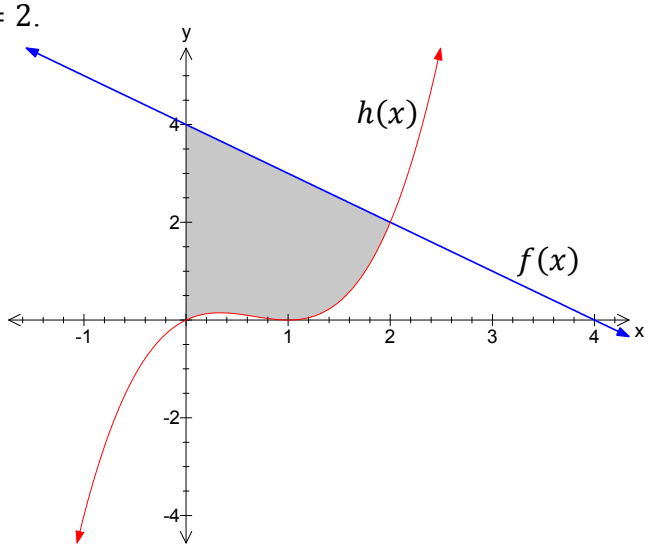
Question 6

Use the relationship $f(x+h) \approx f(x) + hf'(x)$ for a small negative value of h, to find an approximate value for $\sqrt[4]{15.92}$.

4 marks

Question 7

The graphs of $f(x) = -x + 4$ and $h(x) = x(x-1)^2$ are shown below. The graphs intersect at $x = 2$.



a. Find the exact area of the shaded region.

3 marks

b. Find the equation of the normal to the graph of h where it crosses the $y-$ axis.

2 marks

TURN OVER

Question 8

Let $p(x) = \frac{1}{24}(7 - 2x)$ where $x \in \{-1, 0, 1, 2\}$.

a. State with reasons why $p(x)$ is a probability function.

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_____

_____

2 marks

b. Let X be a discrete random variable with the probability function from part a. Find:

i. the mean of the discrete random variable X.

_____

_____

_____

1 mark

ii. $P(X > -1 | X \leq 1)$

_____

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2 marks

END OF QUESTION AND ANSWER BOOK