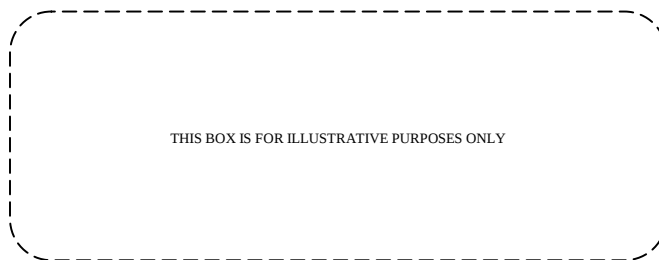




2012 Trial Examination



THIS BOX IS FOR ILLUSTRATIVE PURPOSES ONLY

STUDENT NUMBER

Figures

Words

Letter

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MATHEMATICAL METHODS (CAS)

Units 3 & 4 – Written examination 1

Reading time: 15 minutes

Writing time: 1 hour

QUESTION & ANSWER BOOK

Structure of book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
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.

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 $f(x) = \log_e(x + 3)$ and $g(x) = x^4 + 2$.

- a. Write down a rule for $f(g(x))$

2 marks

- b. Find the derivative of $f(g(x))$.

2 marks

- c. Hence find $f'(g(-2))$

1 mark

Question 2

- a. Find a given that $\int_0^a (5x - 10) dx = 0, a \neq 0$.

2 marks

- b. Find the area between the curve $y = \cos\left(\frac{x}{2}\right)$, the x -axis and the lines $x = 0$ and $x = \pi$.

2 marks

TURN OVER

Question 3

Consider the function $f: R \rightarrow R, f(x) = -4e^{\frac{x}{2}} + 1$.

- a.** Write down a rule for $f^{-1}(x)$.

3 marks

- b.** Find the domain of $f^{-1}(x)$.

1 mark

- c.** Solve for $f^{-1}(x) = 0$.

2 marks

Question 4

Given $f: \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \rightarrow \mathbb{R}, f(x) = 3\cos 2x$

- a. Find the exact values of x for which $f(x) = -\frac{3\sqrt{3}}{2}$.

2 marks

- b. Find the exact values of x for which $f'(x) = 0$.

2 marks

- c. Write down the interval over which the rate of change is negative.

1 mark

TURN OVER

Question 5

A transformation is defined through the matrix equation $\mathbf{T}(\mathbf{X} + \mathbf{B}) = \mathbf{X}'$ where

$\mathbf{T} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$. Find the equation of the image of $y = |x + 2| - 3$ under this transformation.

4 marks

Question 6

A pile of sand forms a right circular cone. Sand is being added at a constant rate of $2\text{m}^3/\text{s}$. The growing pile is shaped such that the radius of its base is equal to half of its height.

- a. Find the volume of the pile when the height of the pile is 6 m.

1 mark

- b. At what rate is the height of the pile increasing when the pile is 6 m high?

2 marks

Question 7

Use the approximation formula $f(x + h) \approx f(x) + hf'(x)$ for a small positive value of h , to find an approximate value for $\sqrt{24.95}$

3 marks

Question 8

The time taken to complete a task (in hours) is a random variable X with probability density function:

$$f(x) = \begin{cases} k(x-1)(4-x) & 1 < x < 4 \\ 0 & \text{elsewhere} \end{cases}$$

where k is a constant, find

- a.** the value of k .

3 marks

Question 8 - continued

TURN OVER

b. $\Pr(X > 3)$

2 marks

Question 9

Sue makes handmade soaps. The mass of soaps X is a normally distributed random variable with mean 220 grams and a standard deviation of 10 grams and let Z be the random variable with the standard normal distribution. Find

a. $\Pr(m < X < 240) \approx 0.95$, find the value of m .

1 mark

b. Sue randomly selects a handmade soap from a box containing several soaps. What is the probability that the soap's mass is less than 210 grams? (Use $\Pr(Z > 1) = 0.16$)

2 marks

Question 9 - continued

2012 MATHMETH (CAS) EXAM 1

- c. Sue randomly selects a handmade soap that had a mass more than the mean mass. What is the probability that its mass is more than 230 grams?

2 marks

END OF QUESTION AND ANSWER BOOK