

2015 Trial Examination

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>
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 (4 marks)

Let $f(x) = \sqrt{3 - 5x}$

- a. Find the domain of $f(x)$.

1 mark

- b. Find the derivative of $f(x)$ with respect to x .

2 marks

- c. Find the exact value of $f'\left(\frac{1}{5}\right)$.

1 mark

Question 2 (6 marks)

Consider $f(x) = \sin(3x)$

- a. Evaluate $F(x) = \int f(x)dx$ given that $F(0) = 0$.

3 marks

- b. Hence, solve the equation $F(x) = \frac{1}{2}$ over $[0, \pi]$.

3 marks

TURN OVER

Question 3 (9 marks)

Consider the function with rule $f(x) = \frac{x-2}{x+2}$

- a.** Find the rule, f^{-1} , for the inverse of f .

3 marks

- b.** Find the domain and range of the inverse of f .

2 marks

- c. Show that $f^{-1}(x)$ can be written in the form $a + \frac{b}{1-x}$ and hence find $\int_0^{\frac{1}{2}} f^{-1}(x) dx$.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

4 marks

Question 4 (8 marks)

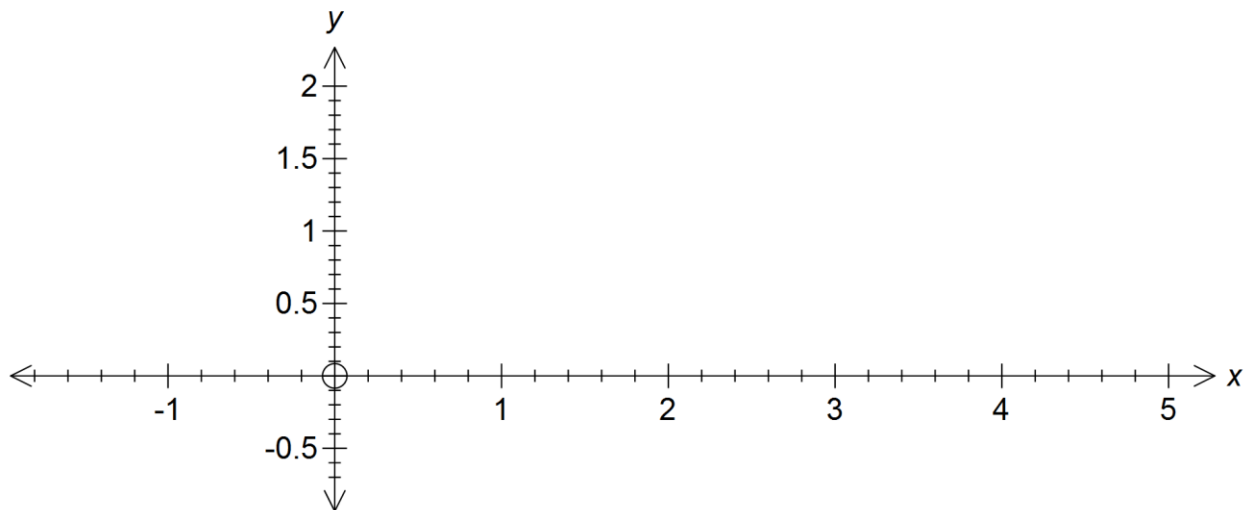
The function $f(x)$ is defined as $f: [0, 3] \rightarrow R$, $f(x) = \frac{1}{4}x^4 - x^3 + x^2$

- a.** Find the stationary points of $f(x)$.

3 marks

TURN OVER

- b.** Sketch the graph of $f(x)$ on the axes below. Label the end-points, stationary points and axes intercepts.



3 marks

- c.** Find the area bounded by the graph of $y = f(x)$ between $x = 0$ and $x = 2$ and the x -axis.

2 marks

Question 5 (5 marks)

Solve the following equations.

a. $\frac{4000}{2+7^{3x}} = 5$

2 marks

b. $2 \times 4^x + 2^x - 1 = 0.$

3 marks

TURN OVER

Question 6 (4 marks)

The discrete random variable X has the following distribution table.

X	0	1	2	3
$Pr(X)$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{1}{10}$	k

- a. Show that $k = \frac{11}{30}$.

1 mark

- b. Find $Pr(X < 2)$.

1 mark

- c. Find the mean of the distribution.

2 marks

Question 7 (2 marks)

The tangent to the curve $y = \frac{3}{x} - 2$ at the point $x = a$ has a gradient of -9. Find the positive value of a .

2 marks

Question 8 (2 marks)

Mink likes to drink juice for breakfast. If she drinks orange juice one day, there is a 60% chance she will drink apple juice the next day. If she drinks apple juice one day, there is a 70% chance she will drink orange juice the next day.

Mink drinks apple juice on Monday. Find the probability that she drinks orange juice on Wednesday.

2 marks

END OF QUESTION AND ANSWER BOOK