

Student Name: _____

MATHEMATICAL METHODS (CAS)

Units 3 & 4 – Written examination 1



2008 Trial Examination

Reading time: 15 minutes

Writing time: 1 hour

QUESTION AND ANSWER BOOK

Structure of book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
12	12	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: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this examination.

Materials supplied

- Question and answer book of 10 pages.

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.

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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.

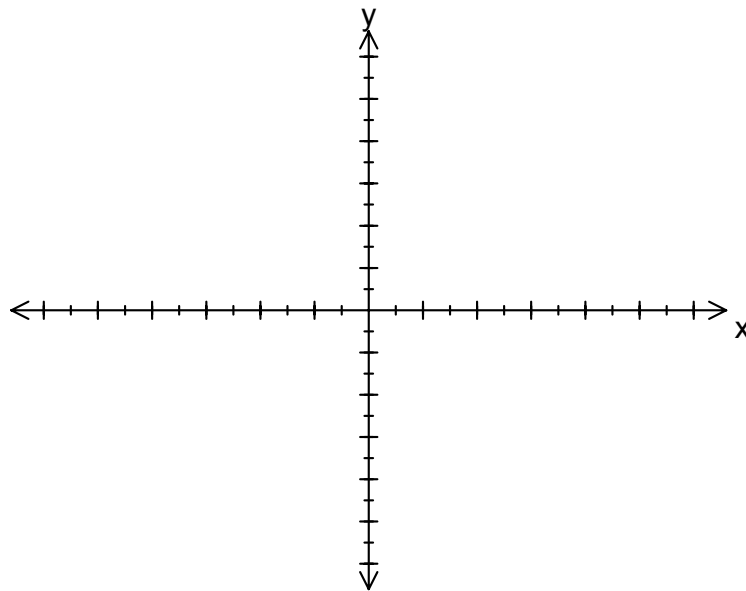
Question 1

- a. State the transformations made to the graph of $y = \frac{1}{x}$ in order to obtain the graph

$$y = -\frac{4}{x-3} - 2.$$

1 mark

- b. Hence or otherwise, sketch $y = -\frac{4}{x-3} - 2$ and label any asymptote(s) and axial intercept(s).



3 marks

TURN OVER

Question 2

Solve $2^{2x} - 2^{x+3} + 2^4 = 0$.

3 marks

Question 3

a. If $f(x) = 1 - 2e^{x-1}$, find the inverse function $f^{-1}(x)$.

3 marks

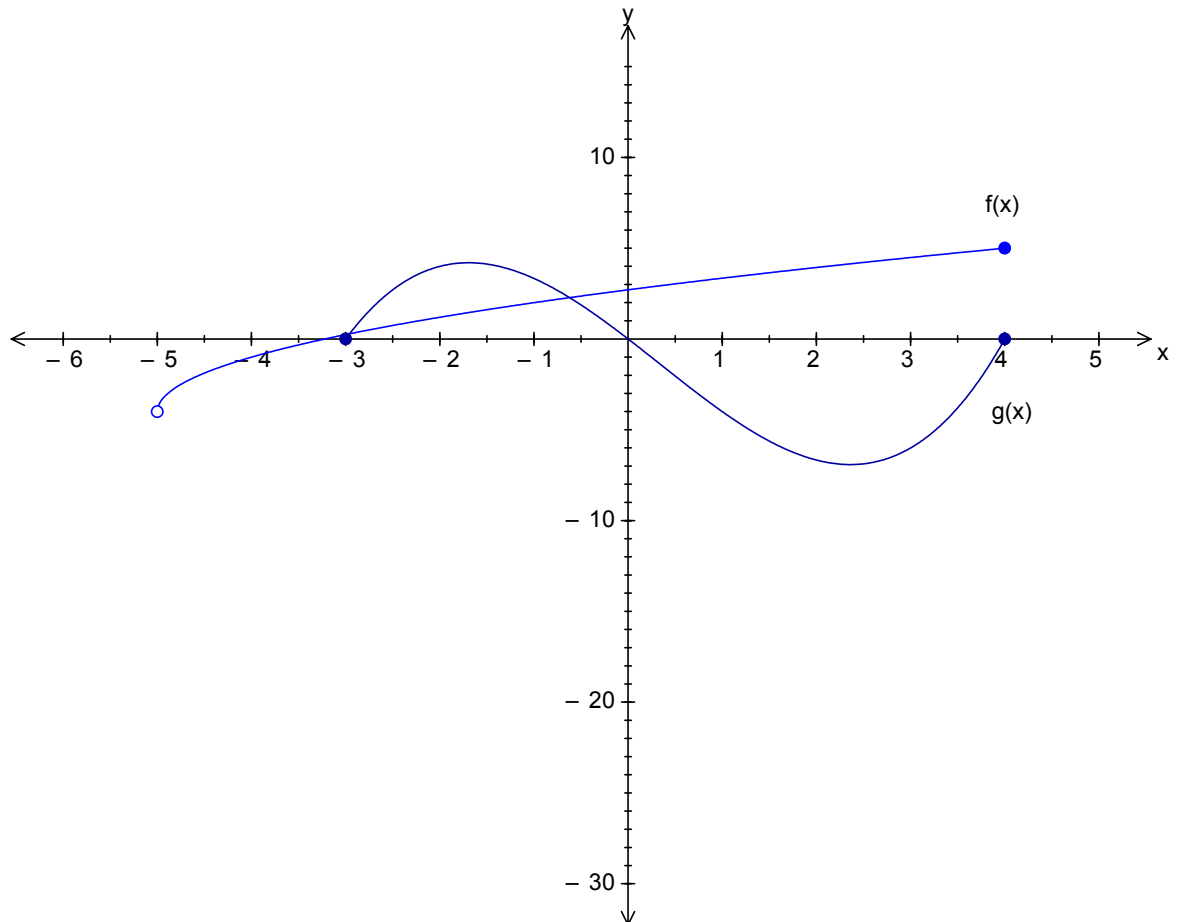
b. State the domain and range of $f^{-1}(x)$.

1 mark

Question 4

Two functions are defined as: $f : (-5, 4] \rightarrow \mathbb{R}, f(x) = 3\sqrt{x+5} - 4$ and

$g : [-3, 4] \rightarrow \mathbb{R}, g(x) = \frac{x}{3}(x+3)(x-4)$. The graphs of these functions are shown below.



- a. On the same set of axes, sketch the graph of $h(x) = f(x).g(x)$.

2 marks

- b. State the domain of $h(x)$.

1 mark

TURN OVER

Question 5

a. If $f(x) = \frac{(3x^2 - 2)^4}{\cos(x)}$, find $f'(x)$.

1 mark

b. Find the derivative of $y = x^2 e^{2x}$.

1 mark

c. Hence find $\int (xe^{2x} + x^2 e^{2x} + 1) dx$.

1 mark

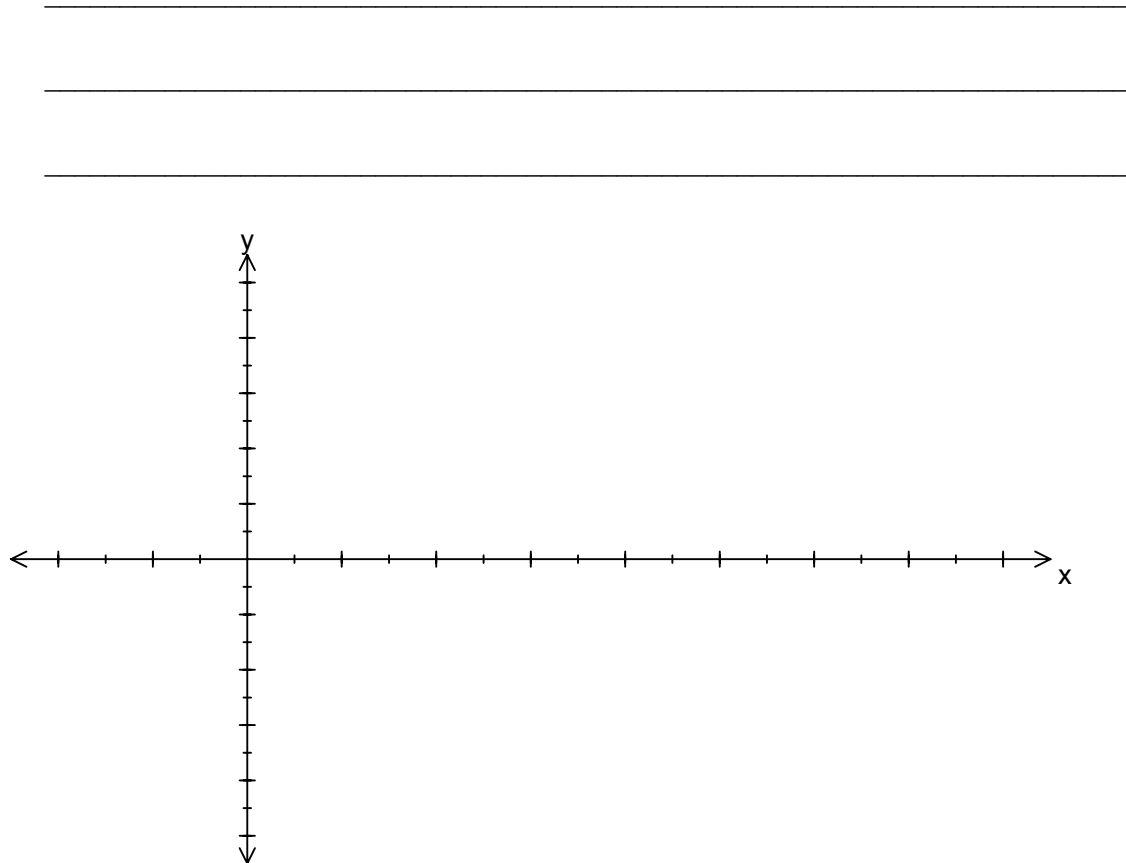
Question 6

Solve the equation $\sqrt{3} \sin(3x) = \cos(3x)$ for $x \in [-\pi, \pi]$.

3 marks

Question 7

- a. Sketch the graph of $y = 2 \tan\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right)$ for $x \in \left(-\frac{\pi}{2}, \frac{7\pi}{2}\right)$. Label the coordinates of all axial intercepts.



3 marks

- b. On the same set of axes, sketch $y = \left| 2 \tan\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right) \right|$ for $x \in \left(-\frac{\pi}{2}, \frac{7\pi}{2}\right)$.

1 mark

TURN OVER

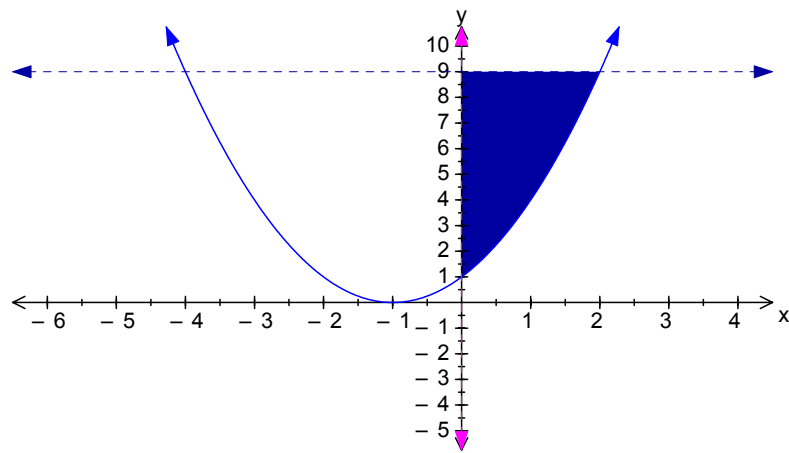
Question 8

Find the equation of the tangent to the curve $y = 3\ln(2x - 3)$ at the point where $x = 3$

3 marks

Question 9

Find the area between the graph of $y = (x + 1)^2$, the right of the **y axis** and the line $y = 9$



3 marks

Question 10

A discrete probability distribution is given by the following table

x	0	1	2	3	4
$p(x)$	0.2	a	b	0.2	0.2

- a. If $E(X) = 2.1$, find the values of a and b .

2 marks

- b. Find $E(2X + 1)$.

1 mark

TURN OVER

Question 11

Tests have shown that if a cat has milk on a particular day, there's a 90% chance that it will choose pellets on the next day. But if a cat has pellets on a particular day, there is an 80% chance that it will choose milk on the next day.

- a. If Jim's cat had milk on Monday, find the probability that it will have pellets on Thursday. Give answer as a **fraction**.

4 marks

Question 12

The heights of women are normally distributed with a mean of 160cm and a standard deviation of 8cm.

- a. Between what values are approximately 95% of the women's heights?

1 mark

- b. If $\Pr(H > 170) = 0.1$, then find the probability that a woman's height is less than 170cm, given that it is more than 160cm.

2 marks

END OF QUESTION AND ANSWER BOOK