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Trial Exam Paper

2008
MATHEMATICAL METHODS/ MATHEMATICAL METHODS (CAS)
Written examination 1

PLEASE NOTE: The written examinations for Mathematical Methods 1 and Mathematical Methods 1 (CAS) are identical.

STUDENT NAME:

QUESTION AND ANSWER BOOK

Reading time: 15 minutes

Writing time: 1 hour

Structure of book

Number of questions	*Number of questions to be answered*	*Number of marks*
12	12	40

- Students are permitted to bring the following items into the examination: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring notes of any kind, sheets of paper, white out liquid/tape or a calculator into the examination.

Materials provided

- The question and answer book of 10 pages, with a separate sheet of miscellaneous formulas.
- Working space is provided throughout the question book.

Instructions

- Write your **name** in the box provided.
- Remove the formula sheet during reading time.
- You must answer the questions in English.

Students are NOT permitted to bring mobile phones or any other electronic devices into the examination.

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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. Let $f(x) = e^{2x} \sin x$. Find $f'(x)$.

2 marks

b. If $f : (-\infty, 3) \to R$, is such that $f'(x) = \frac{1}{x-3}$ and $f(2) = 4$. Find the rule for $f(x)$.

2 marks

Question 2

a. Let $f(x) = 2x - 5$ and $g(x) = \sin x$. Evaluate $f(g(\frac{\pi}{6}))$.

2 marks

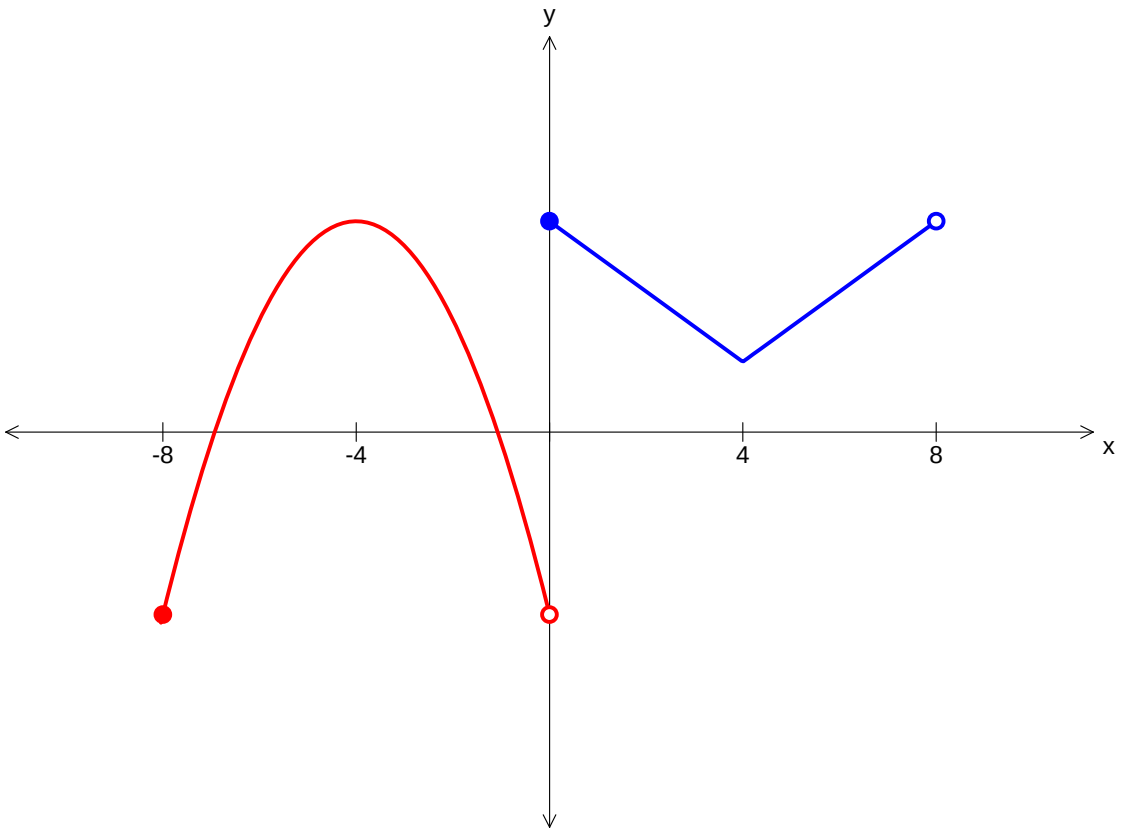
b. The equation $y = 4x^3 + 8x^2 - 11x + 3$ can be written in the form $y = (x+3)(ax-b)^2$ where $a,b>0$. State the values of a and b.

2 marks

TURN OVER

Question 3

The diagram shows the graph of a function with domain $[-8,8)$.



a. For what values of x is the graph of the function continuous?

_____

_____

1 mark

b. For the graph shown above, sketch on the same set of axes the graph of the derivative function.

2 marks

c. Write down the domain of the derivative function.

_____

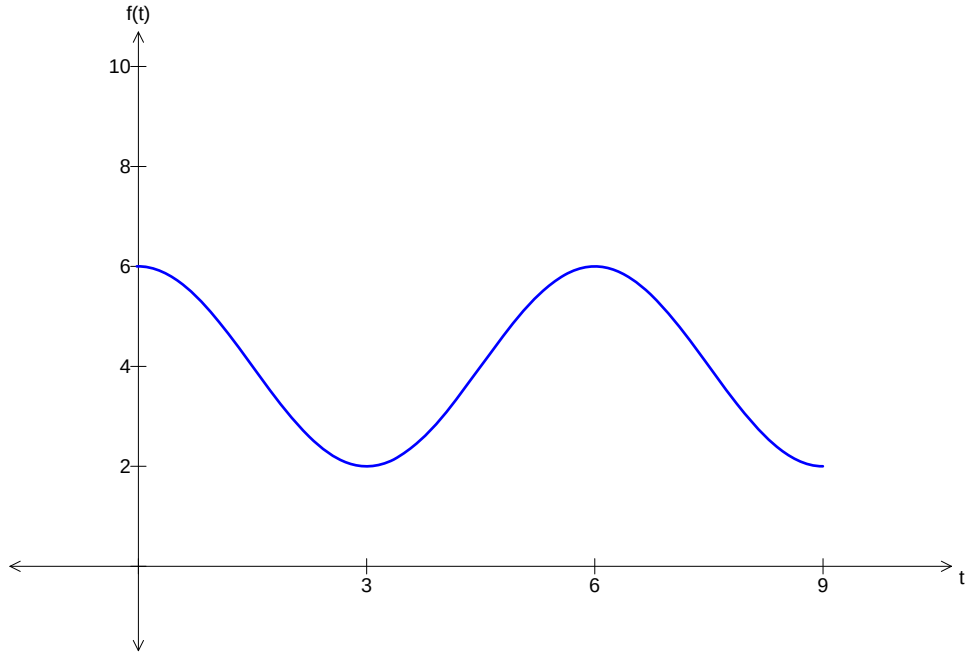
_____

1 mark

Question 4

The graph shown is that of a function with the rule

$f : [0,9] \to R, \quad f(t) = A\cos(nt) + b$.



a. Find A, n and b.

3 marks

b. Solve the equation $f(t) = 3$ for $t \in [0,9]$.

2 marks

TURN OVER

c. Let $g:[-1,8] \to R,\ g(t) = 3f(t+1) - 1$.

Find the smallest value of p such that $g(t) = p$ has exactly 2 solutions.

1 mark

Question 5

If $f(x) = \log_e(x^2+1)$, then $f'(x) = \dfrac{2x}{x^2+1}$.

Use this fact to find an antiderivative of $\dfrac{(x+1)^2}{x^2+1}$.

2 marks

Question 6

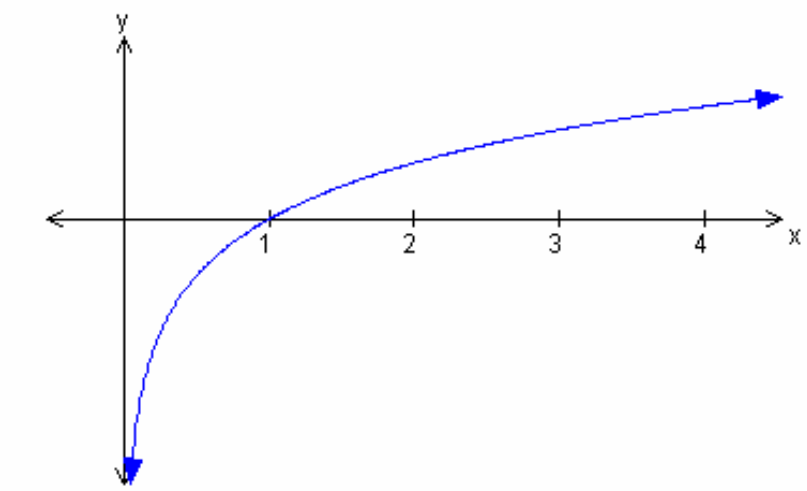
A binomial random variable has a mean of 12 and a variance of 9.

Find the parameters *n* and *p*.

2 marks

Question 7

The given graph is of the function $y = \log_e(x)$



Using three right rectangles, the approximate area bounded by this function and the x axis between $x = 1$ and $x = 4$ is given by $\log_e B$. Find the value of B.

2 marks

Question 8

Two events A and B, from a given event space, are such that
$\Pr(A \cap B) = 0.18$, $\Pr(A) = x$ *and* $\Pr(B) = 2x$,

a. find x if $\Pr(A \cup B) = 0.78$.

2 marks

TURN OVER

b. find x if A and B are independent .

_____

_____

_____

_____

2 marks

Question 9

a. The graph of g is obtained from the graph of the function f with rule $f(x) = e^{x+2}$ by a translation of $+3$ units parallel to the x-axis. Write down the rule for g.

_____

_____

1 mark

b. The graph of h is obtained from the graph of g by a reflection in the y-axis. Write down the rule for h.

_____

_____

1 mark

c. The graph of k is obtained from the graph of h by a dilation by a scale factor of $\frac{1}{3}$ from the y-axis. Write down the rule for k.

_____

_____

1 mark

Question 10

The random variable X has the following probability distribution.

x	0	1	2
$\Pr(X = x)$	a	0.4	b

If the mean of X is 1.3, find the value of a and b.

3 marks

Question 11

Find the exact area bounded by the curves $y = e^{-2x}$, $y = e^{-4x}$, the y-axis and the line $x = 1$.

3 marks

CONTINUED
PLEASE TURN OVER

Question 12

Find the value of k for which $y = \frac{-1}{4}x + k$ is a normal to $y = 2x^2 - 8x$.

3 marks

END OF QUESTION AND ANSWER BOOK