



# Cambridge International AS & A Level

CANDIDATE  
NAME
CENTRE  
NUMBER

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

CANDIDATE  
NUMBER

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|--|--|--|--|

**MATHEMATICS****9709/22**

Paper 2 Pure Mathematics 2

**October/November 2024****1 hour 15 minutes**

You must answer on the question paper.

You will need: List of formulae (MF19)

## INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

## INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

\* 000080000002 \*



Kambridge Math & Physics  
kambridgemp.com





Kambridge Math & Physics

kambridgemp.com

**(a)** Find the value of  $f'\left(\frac{1}{4}\pi\right)$ . [3]

(b) Find  $\int f(x) dx$ . [3]



5

[6]

Kambridge Math & Physics

kambridgemp.com

- [2]

- [2]

[illegible]



(c) Use an iterative formula, based on the equation in part (b), to find the  $x$ -coordinate of  $P$  correct to 3 significant figures. Use an initial value of 0.45 and give the result of each iteration to 5 significant figures. [3]

Cambridge Math & Physics

kambridgeemp.com



**5** The polynomial  $p(x)$  is defined by

$$p(x) = ax^3 + bx^2 - ax + 8,$$

where  $a$  and  $b$  are constants. It is given that  $(x+2)$  is a factor of  $p(x)$ , and that the remainder is 24 when  $p(x)$  is divided by  $(x-2)$ .

**(a)** Find the values of  $a$  and  $b$ .

[4]

Cambridge Math & Physics

kambridgemp.com





- (b) Factorise  $p(x)$  and hence show that the equation  $p(x) = 0$  has exactly one real root. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Solve the equation  $p\left(\frac{1}{2}\operatorname{cosec}\theta\right) = 0$  for  $-90^\circ < \theta < 90^\circ$ . [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

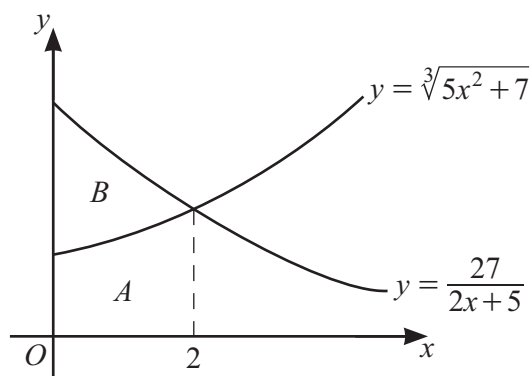
.....

.....

.....

.....





The diagram shows the curves with equations  $y = \sqrt[3]{5x^2 + 7}$  and  $y = \frac{27}{2x+5}$  for  $x \geq 0$ .

The curves meet at the point  $(2, 3)$ .

Region  $A$  is bounded by the curve  $y = \sqrt[3]{5x^2 + 7}$  and the straight lines  $x = 0$ ,  $x = 2$  and  $y = 0$ .

Region  $B$  is bounded by the two curves and the straight line  $x = 0$ .

- (a) Use the trapezium rule with two intervals to find an approximation to the area of region  $A$ . Give your answer correct to 3 significant figures. [3]





- (b) Find the exact total area of regions  $A$  and  $B$ . Give your answer in the form  $k \ln m$ , where  $k$  and  $m$  are constants. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Deduce an approximation to the area of region  $B$ . Give your answer correct to 3 significant figures. [1]

.....

.....

.....

.....

.....

- (d) State, with a reason, whether your answer to part (c) is an over-estimate or an under-estimate of the area of region  $B$ . [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



where  $a$  and  $R$  are positive integers and  $0^\circ < \alpha < 90^\circ$ . [6]

Cambridge Math & Physics

kambridgemp.com



Kambridge Math & Physics  
kbridgeemp.com



Additional page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

Lined area for writing answers, consisting of multiple horizontal dotted lines.

Kambridge Math & Physics  
kambridgemp.com





\* 000080000015 \*

Kambridge Math & Physics  
kambridgemp.com





Kambridge Math & Physics  
kambridgemp.com

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

