



Cambridge International AS & A Level

CANDIDATE
NAME

--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

MATHEMATICS

9709/22

Paper 2 Pure Mathematics 2

October/November 2020

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. Blank pages are indicated.



BLANK PAGE

- 1** Solve the equation $7 \cot \theta = 3 \operatorname{cosec} \theta$ for $0^\circ < \theta < 90^\circ$. [3]

[illegible]

- 2 Given that $\frac{2^{3x+2} + 8}{2^{3x} - 7} = 5$, find the value of 2^{3x} and hence, using logarithms, find the value of x correct to 4 significant figures. [5]

[illegible]

- 3 (a) Sketch, on a single diagram, the graphs of $y = \left| \frac{1}{2}x - a \right|$ and $y = \frac{3}{2}x - \frac{1}{2}a$, where a is a positive constant. [2]

- (b) Find the coordinates of the point of intersection of the two graphs. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Deduce the solution of the inequality $\left| \frac{1}{2}x - a \right| > \frac{3}{2}x - \frac{1}{2}a$. [1]

.....

.....

.....

.....

.....

- (b)** Use the trapezium rule with three intervals to find an approximation to the area of the shaded region. Give the answer correct to 2 significant figures. [3]

[illegible]

5 The equation of a curve is $2e^{2x}y - y^3 + 4 = 0$.

(a) Show that $\frac{dy}{dx} = \frac{4e^{2x}y}{3y^2 - 2e^{2x}}$. [4]

[illegible]

- (b) The curve passes through the point $(0, 2)$.

Find the equation of the tangent to the curve at this point, giving your answer in the form $ax + by + c = 0$. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Show that the curve has no stationary points. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6 (a) Find $\int \left(\frac{8}{4x+1} + \frac{8}{\cos^2(4x+1)} \right) dx$. [4]

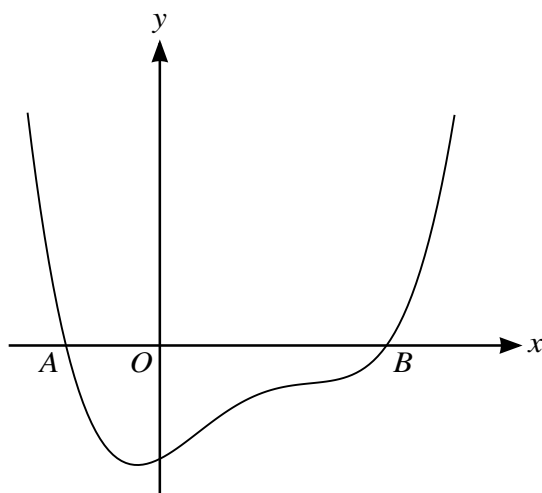
[illegible]

- (b)** It is given that $\int_0^{\frac{1}{2}\pi} (3 + 4 \cos^2 \frac{1}{2}x + k \sin 2x) \, dx = 10$.

Find the exact value of the constant k .

[6]

[illegible]



A curve has equation $y = f(x)$ where $f(x) = x^4 - 5x^3 + 6x^2 + 5x - 15$. As shown in the diagram, the curve crosses the x -axis at the points A and B with coordinates $(a, 0)$ and $(b, 0)$ respectively.

- (a) Use the factor theorem to show that $(x - 3)$ is a factor of $f(x)$. [2]

.....

.....

.....

.....

.....

- (b) By first finding the quotient when $f(x)$ is divided by $(x - 3)$, show that

$$a = -\sqrt{\frac{5}{2-a}}. \quad [5]$$

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Use an iterative formula, based on the equation in part (b), to find the value of a correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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.

[illegible]

BLANK PAGE

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 after the live examination series.

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