



Cambridge Pre-U

MATHEMATICS

9794/01

Paper 1 Pure Mathematics 1

May/June 2023

2 hours

You must answer on the answer booklet/paper.

You will need: Answer booklet/paper
Graph paper
List of formulae (MF20)

INSTRUCTIONS

- Answer **all** questions.
- If you have been given an answer booklet, follow the instructions on the front cover of the answer booklet.
- 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 on all the work you hand in.
- Do **not** use an erasable pen or correction fluid.
- 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.
- At the end of the examination, fasten all your work together. Do **not** use staples, paper clips or glue.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

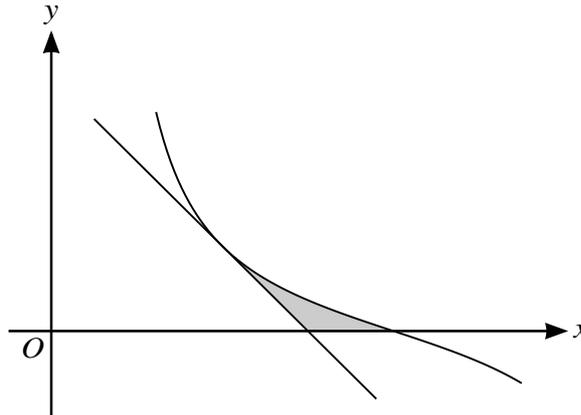
This document has 4 pages. Any blank pages are indicated.



- 1** Solve the equation $3 \sin 3\theta = 2 \cos 3\theta$ for $0^\circ < \theta < 180^\circ$. [4]
- 2** (a) Express $2x^2 + 8x$ in the form $p(x + q)^2 + r$, where p , q and r are constants. [3]
 (b) Given that $x^2 + 4x > k$ for all values of x , state the set of values of k . [2]
- 3** A circle has equation $x^2 + y^2 - 7x = 12$.
 (a) Find the coordinates of the points of intersection of the line $y = x + 3$ and this circle. [5]
 (b) The equation of a diameter of this circle is $y = x + c$. Find the value of the constant c . [3]
- 4** (a) On the same axes sketch the graphs of $y = 2x + 1$ and $y = |x - 5|$. [3]
 (b) Solve the inequality $2x + 1 < |x - 5|$. [3]
- 5** Show that the curve $y = x^2 \ln x$ has only one stationary point, and find its exact coordinates. [6]
- 6** Solve the simultaneous equations $\log_2(xy^2) = 3$ and $2 \log_2 x + 3 \log_2 y = 4$. [6]
- 7** The gradient of a curve is given by $\frac{dy}{dx} = \frac{kx(x-2)}{y}$, where k is a constant. The curve passes through the point $(3, 2)$, and the gradient of the curve at this point is $\frac{9}{4}$. Find the equation of the curve, giving your answer in the form $f(y) = g(x)$. [6]
- 8** A line has equation $\frac{x-5}{2} = \frac{y+6}{3} = 2-z$.
 (a) Show that this line intersects the x -axis, and state the coordinates of the point of intersection. [3]
 A second line has equation $\mathbf{r} = (3 + 7\mu)\mathbf{i} + (2 - 3\mu)\mathbf{j} + (-4 + 2\mu)\mathbf{k}$.
 (b) Find the acute angle between the two lines. [4]
- 9** (a) Find the values of the real constants a and b , such that $3 - 2i$ is a root of the equation $z^2 + az + b = 0$. [4]
 (b) Find the values of the real constants c and d , such that $\frac{c-i}{2+di} = 3 - 2i$. [4]
 (c) State the values of the real constants p and q , such that the locus $|z - (3 - 2i)| = |z - (p + qi)|$ has equation $\text{Re}(z) = 5$. [2]

- 10** In a geometric progression the first term is 3 and the common ratio is $\sqrt{3} \tan 2\theta$, where $-\frac{1}{4}\pi < \theta < \frac{1}{4}\pi$.
- (a) Given that the third term is 27, find the possible values of θ . [4]
- (b) Given instead that the geometric progression converges, find the set of possible values of θ . [3]
- (c) It is given that when $\theta = \frac{1}{24}\pi$ the sum to infinity of the geometric progression is $\frac{3}{2}(2 + \sqrt{3})$.
Hence show that $\tan\left(\frac{1}{12}\pi\right) = 2 - \sqrt{3}$. [5]

11



The diagram shows part of the curve $y = \frac{x-2}{x^2-4x+1}$, and the tangent to the curve at the point $(1, \frac{1}{2})$.
Find the exact area of the shaded region enclosed by this part of the curve, the tangent and the x -axis. [10]

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 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.