



Cambridge IGCSE™

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
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ADDITIONAL MATHEMATICS

0606/11

Paper 1

October/November 2023

2 hours

You must answer on the question paper.

No additional materials are needed.

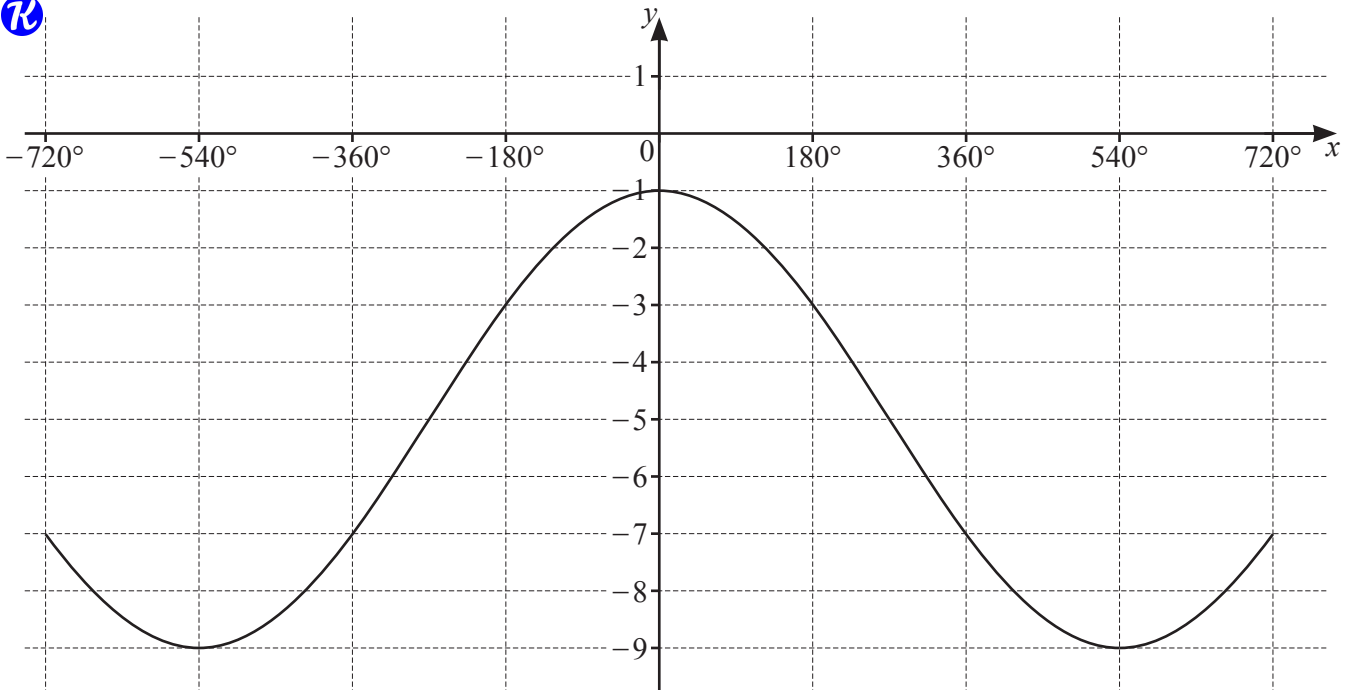
INSTRUCTIONS

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

This document has **16** pages.

1
7

The diagram shows part of the graph of $y = a \cos\left(\frac{x}{b}\right) + c$, where a , b and c are integers. Find the values of a , b and c . [3]


2 The polynomial $P(x)$ is such that $P(x) = ax^3 - 11x^2 + bx + c$, where a , b and c are integers. $P(x)$ is
 divisible by x and has a remainder of $\frac{3}{2}$ when divided by $2x + 1$. It is also given that $P'(2) = 18$.

(a) Find the values of a , b and c .

[6]

(b) Hence write $P(x)$ as a product of three linear factors.

[2]

- 3 The point A has position vector $\begin{pmatrix} 2 \\ -6 \end{pmatrix}$. The point B has position vector $\begin{pmatrix} -3 \\ 6 \end{pmatrix}$.
-  (a) Find, in vector form, the displacement of B from A . [2]

- (b) Find the distance AB . [1]

The point X is such that $3\vec{AB} = 2\vec{AX}$.

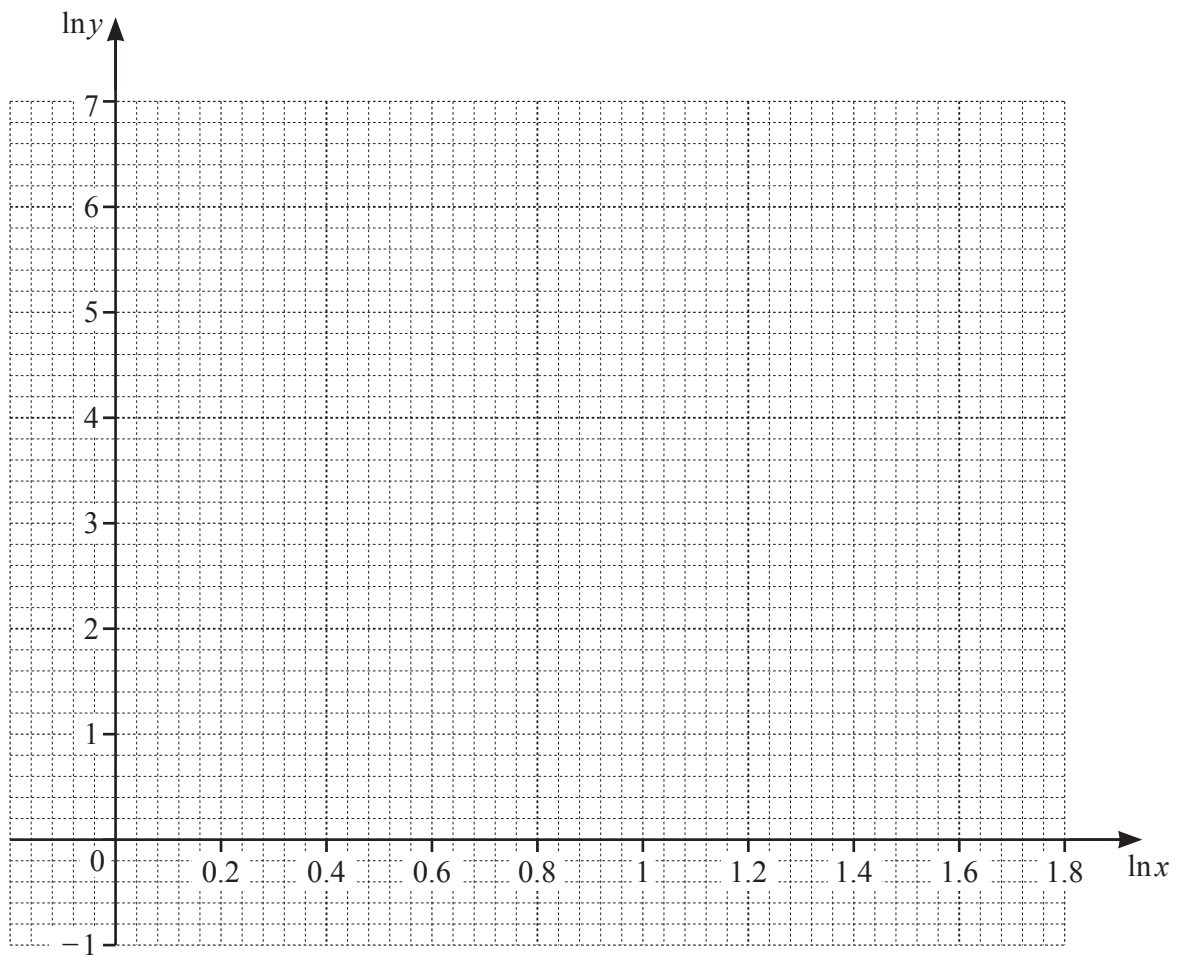
- (c) Find the position vector of X . [2]



| | | | | | |
|-----|----|----|-----|-----|-----|
| x | 1 | 2 | 3 | 4 | 5 |
| y | 20 | 57 | 104 | 160 | 224 |

The table shows values of the variables x and y , which are related by the equation $y = Ax^b$, where A and b are constants.

- (a) Use the data to draw a straight line graph of $\ln y$ against $\ln x$. [3]



- (b) Use your graph to estimate the values of A and b . Give your answers correct to 2 significant figures. [4]

- (c) Use your graph to estimate the value of y when $x = 3.5$. [2]

5 (a) A 4-digit code is to be formed from the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. No digit may be used more than once in any code. A code may start with 0.



(i) Find how many codes can be formed. [1]

(ii) Find how many codes form an odd number. [1]

(iii) Find how many codes form a number greater than 1000. [2]

(b) A team of 9 people is to be chosen from a group of 15 people. The group includes a family of 4 people who must not be separated. Find the number of teams that can be chosen. [3]

6 (a) Write $3 \lg x - \frac{1}{2} \lg 4 + 2$ as a single logarithm to base 10. [3]



(b) Solve the equation $2 \log_a 4 - 3 \log_4 a - 5 = 0$, giving your answers in exact form. [5]

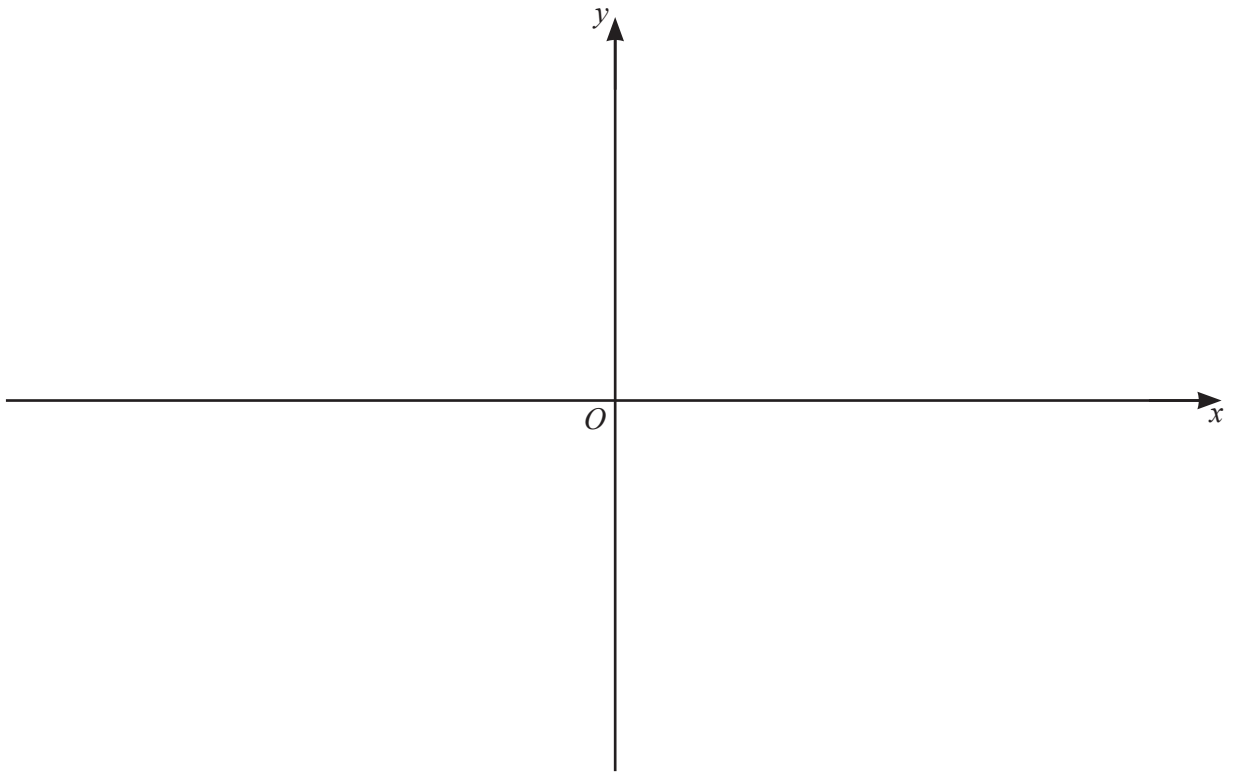
7 A curve has equation $y = f(x)$, where $f(x) = (2x+1)(3x-2)^2$.



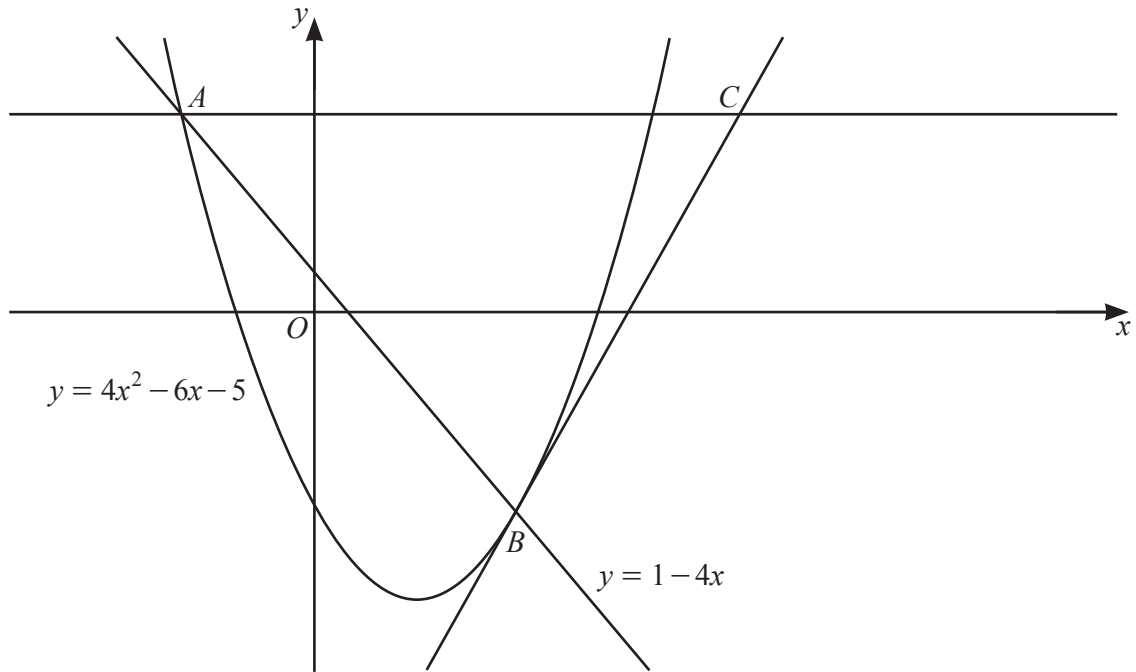
(a) Show that $f'(x)$ can be written in the form $2(3x-2)(px+q)$, where p and q are integers. [3]

(b) Hence find the coordinates of the stationary points on the curve. [2]

- (c) On the axes below, sketch the graph of $y = f(x)$, stating the intercepts with the coordinate axes. [3]



- (d) Find the values of k such that the equation $f(x) = k$ has 3 distinct solutions. [2]

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The diagram shows the line $y = 1 - 4x$ meeting the curve $y = 4x^2 - 6x - 5$ at the points A and B . The tangent to the curve at B meets the horizontal line through A at the point C . Find the x -coordinate of C , giving your answer correct to 2 decimal places. [10]

- 9 (a) The first three terms of an arithmetic progression are $-3 \tan \frac{\theta}{2}$, $-\tan \frac{\theta}{2}$, $\tan \frac{\theta}{2}$,
where $0 < \theta < \frac{\pi}{2}$.



- (i) Given that the 12th term of this progression is equal to $\frac{19\sqrt{3}}{3}$, find the exact value of θ . [4]

- (ii) Hence find the exact value of the sum to ten terms of this progression. [2]

- (b) The first three terms of a geometric progression are $\frac{1}{16}\operatorname{cosec}^4\phi$, $\frac{1}{4}\operatorname{cosec}^2\phi$, 1,
where $-\frac{\pi}{2} < \phi < \frac{\pi}{2}$.
- (i) Given that the sum of the 3rd and 4th terms of this progression is equal to 4, find the possible values of ϕ . [4]

- (ii) Determine whether or not this progression has a sum to infinity. [2]

- 10 (a) Given that $y = \frac{\sqrt{3x^2 - 2}}{x - 4}$, show that $\frac{dy}{dx}$ can be written in the form $\frac{Ax + B}{(x - 4)^2 \sqrt{3x^2 - 2}}$,
where A and B are integers to be found. [5]

- (b) Hence find, in terms of h , the approximate change in y when x increases from 3 to $3 + h$, where h is small. [3]