



# Cambridge IGCSE™

CANDIDATE  
NAME

--

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**ADDITIONAL MATHEMATICS**

**0606/22**

Paper 2

**May/June 2022**

**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 [ ].

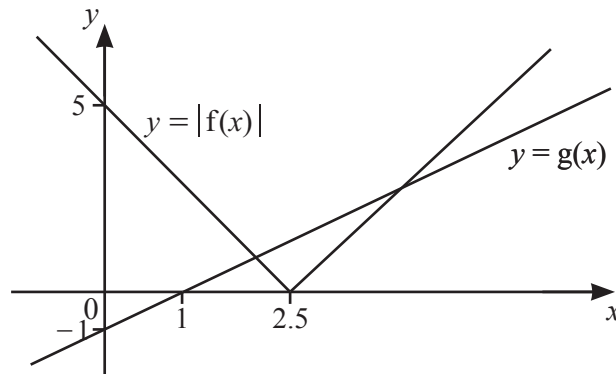
This document has **16** pages.

## 1 DO NOT USE A CALCULATOR IN THIS QUESTION.



A curve has equation  $y = \frac{6 + \sqrt{x}}{3 + \sqrt{x}}$  where  $x \geq 0$ . Find the exact value of  $y$  when  $x = 6$ . Give your answer in the form  $a + b\sqrt{c}$ , where  $a$ ,  $b$  and  $c$  are integers. [3]

## 2



The diagram shows the graphs of  $y = |f(x)|$  and  $y = g(x)$ , where  $y = f(x)$  and  $y = g(x)$  are straight lines. Solve the inequality  $|f(x)| \leq g(x)$ . [5]

- 3 Find the possible values of  $k$  for which the equation  $kx^2 + (k+5)x - 4 = 0$  has real roots. [5]



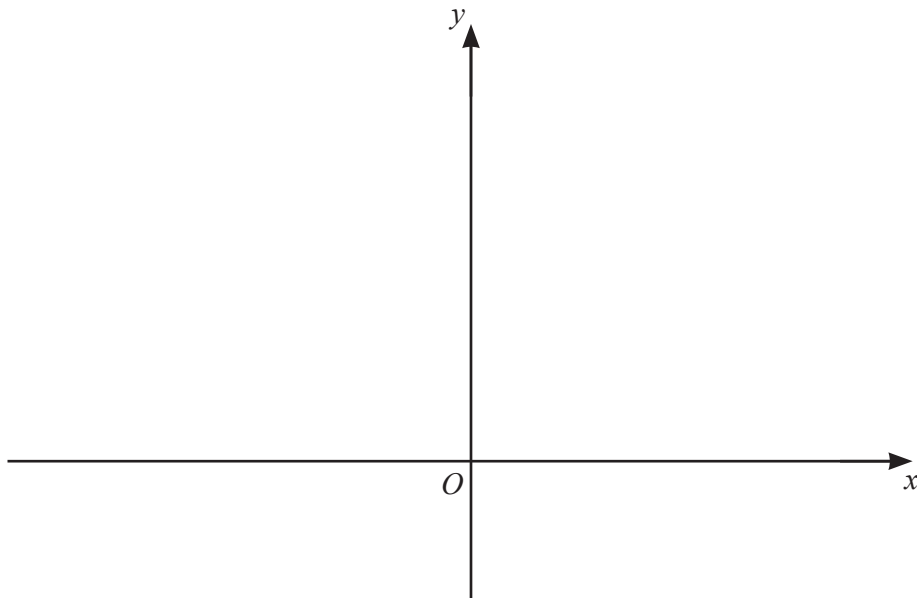
- 4 Variables  $x$  and  $y$  are related by the equation  $y = 1 + \frac{2}{x} + \frac{1}{x^2}$  where  $x > 0$ . Use differentiation to find the approximate change in  $x$  when  $y$  increases from 4 by the small amount 0.01. [5]



5 (a) Solve the equation  $\frac{625^{\frac{x^3-1}{2}}}{125^{x^3}} = 5$ .

[3]

- (b) On the axes, sketch the graph of  $y = 4e^x + 3$  showing the values of any intercepts with the coordinate axes. [2]



6 (a) In this question,  $\mathbf{i}$  is a unit vector due east and  $\mathbf{j}$  is a unit vector due north.

7

A cyclist rides at a speed of  $4 \text{ ms}^{-1}$  on a bearing of  $015^\circ$ . Write the velocity vector of the cyclist in the form  $x\mathbf{i} + y\mathbf{j}$ , where  $x$  and  $y$  are constants. [2]

(b) A vector of magnitude 6 on a bearing of  $300^\circ$  is added to a vector of magnitude 2 on a bearing of  $230^\circ$  to give a vector  $\mathbf{v}$ . Find the magnitude and bearing of  $\mathbf{v}$ . [5]

7 Differentiate  $y = \frac{e^{4x} \tan x}{\ln x}$  with respect to  $x$ .



[4]

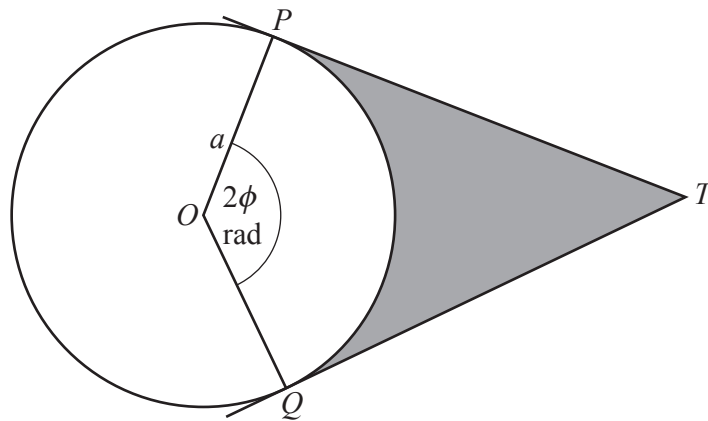
8 The function  $f$  is defined by  $f(x) = 3 \sin^2 x - 2 \cos x$  for  $2 \leq x \leq 4$ , where  $x$  is in radians.



(a) Find the  $x$ -coordinate of the stationary point on the curve  $y = f(x)$ . [5]

(b) Solve the equation  $f(x) = 1 - 3 \cos x$ . [5]

9 In this question all lengths are in centimetres.



The diagram shows a circle, centre  $O$ , radius  $a$ . The lines  $PT$  and  $QT$  are tangents to the circle at  $P$  and  $Q$  respectively. Angle  $POQ$  is  $2\phi$  radians.

- (a) In the case when the area of the sector  $OPQ$  is equal to the area of the shaded region, show that  $\tan \phi = 2\phi$ . [4]

- (b) In the case when the perimeter of the sector  $OPQ$  is equal to half the perimeter of the shaded region, find an expression for  $\tan \phi$  in terms of  $\phi$ . [3]

- 10** (a) A geometric progression has first term  $a$  and common ratio  $r$ , where  $r > 0$ . The second term of this progression is 8. The sum of the third and fourth terms is 160.

**7**

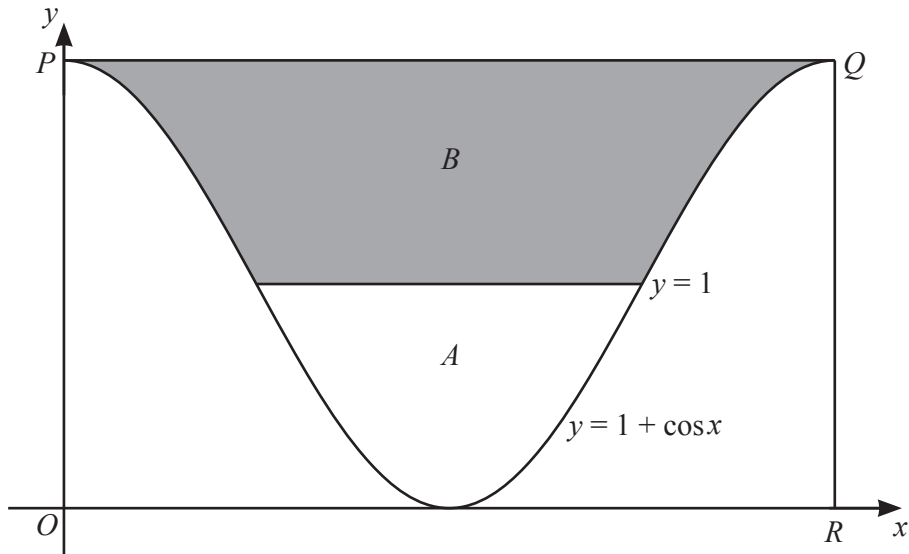
(i) Show that  $r$  satisfies the equation  $r^2 + r - 20 = 0$ . [4]

(ii) Find the value of  $a$ . [3]

- (b) An arithmetic progression has first term  $p$  and common difference 2. The  $q$ th term of this progression is 14.  
A different arithmetic progression has first term  $p$  and common difference 4. The sum of the first  $q$  terms of this progression is 168.

Find the values of  $p$  and  $q$ . [6]

11



The diagram shows part of the line  $y = 1$  and one complete period of the curve  $y = 1 + \cos x$ , where  $x$  is in radians. The line  $PQ$  is a tangent to the curve at  $P$  and at  $Q$ . The line  $QR$  is parallel to the  $y$ -axis. Area  $A$  is enclosed by the line  $y = 1$  and the curve. Area  $B$  is enclosed by the line  $y = 1$ , the line  $PQ$  and the curve.

Given that area  $A$  : area  $B$  is  $1 : k$  find the exact value of  $k$ .

[9]

- 12 A curve is such that  $\frac{d^2y}{dx^2} = \left(\frac{\sqrt{x+1}}{\sqrt[4]{x}}\right)^2$ . Given that the gradient of the curve is  $\frac{4}{3}$  at the point  $(1, -1)$ ,  
find the equation of the curve. [7]