



ADVANCED GCE
MATHEMATICS
 Core Mathematics 4

4724

Candidates answer on the Answer Booklet

OCR Supplied Materials:

- 8 page Answer Booklet
- List of Formulae (MF1)

Other Materials Required:

- Scientific or graphical calculator

Friday 11 June 2010
Morning

Duration: 1 hour 30 minutes



INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphical calculator in this paper.

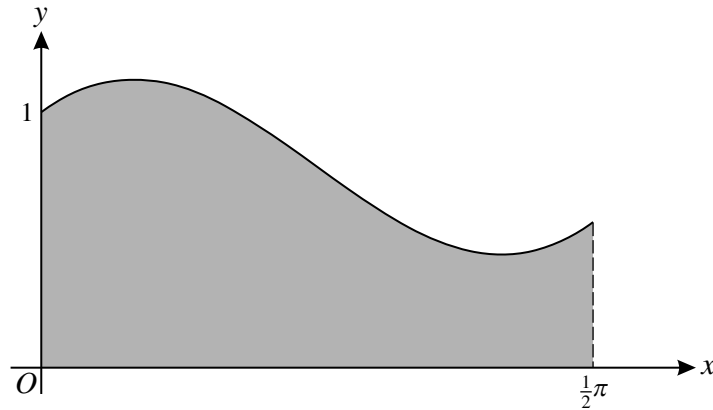
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- This document consists of **4** pages. Any blank pages are indicated.

- 1 Expand $(1 + 3x)^{-\frac{5}{3}}$ in ascending powers of x , up to and including the term in x^3 . [5]
- 2 Given that $y = \frac{\cos x}{1 - \sin x}$, find $\frac{dy}{dx}$, simplifying your answer. [4]
- 3 Express $\frac{x^2}{(x-1)^2(x-2)}$ in partial fractions. [5]
- 4 Use the substitution $u = \sqrt{x+2}$ to find the exact value of
- $$\int_{-1}^7 \frac{x^2}{\sqrt{x+2}} dx. \quad [7]$$
- 5 Find the coordinates of the two stationary points on the curve with equation
- $$x^2 + 4xy + 2y^2 + 18 = 0. \quad [7]$$
- 6 Lines l_1 and l_2 have vector equations
- $$\mathbf{r} = \mathbf{j} + \mathbf{k} + t(2\mathbf{i} + a\mathbf{j} + \mathbf{k}) \quad \text{and} \quad \mathbf{r} = 3\mathbf{i} - \mathbf{k} + s(2\mathbf{i} + 2\mathbf{j} - 6\mathbf{k})$$
- respectively, where t and s are parameters and a is a constant.
- (i) Given that l_1 and l_2 are perpendicular, find the value of a . [3]
- (ii) Given instead that l_1 and l_2 intersect, find
- (a) the value of a , [4]
- (b) the angle between the lines. [3]
- 7 The parametric equations of a curve are $x = \frac{t+2}{t+1}$, $y = \frac{2}{t+3}$.
- (i) Show that $\frac{dy}{dx} > 0$. [6]
- (ii) Find the cartesian equation of the curve, giving your answer in a form not involving fractions. [5]
- 8 (i) Find the quotient and the remainder when $x^2 - 5x + 6$ is divided by $x - 1$. [3]
- (ii) (a) Find the general solution of the differential equation
- $$\left(\frac{x-1}{x^2 - 5x + 6} \right) \frac{dy}{dx} = y - 5. \quad [3]$$
- (b) Given that $y = 7$ when $x = 8$, find y when $x = 6$. [4]

9 (i) Find $\int (x + \cos 2x)^2 dx$. [9]

(ii)



The diagram shows the part of the curve $y = x + \cos 2x$ for $0 \leq x \leq \frac{1}{2}\pi$. The shaded region bounded by the curve, the axes and the line $x = \frac{1}{2}\pi$ is rotated completely about the x -axis to form a solid of revolution of volume V . Find V , giving your answer in an exact form. [4]



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity. For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

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