

Core Mathematics C3 Advanced Level

For Edexcel

Paper A

Time: 1 hour 30 minutes

Instructions and Information

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration.

Full marks may be obtained for answers to ALL questions.

The booklet 'Mathematical Formulae and Statistical Tables', available from Edexcel, may be used.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner.
Answers without working may gain no credit.

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1. $f(x)$ and $g(x)$ are two functions of x .

$$g^{-1}(x) = f(x) \text{ for all } x \in \mathbb{R}.$$

What is $fg(x)$? (3)

2. Given $f(x) = x^2 - 5x + 6$, $x \in \mathbb{R}$, sketch the graphs of

(a) $y = f(x)$, (2)

(b) $y = f(|x|)$ (3)

(c) $y = |f(x)|$ (3)

on three separate graphs. Indicate clearly the points of intersection of the curves with the coordinate axes. Label each curve clearly.

3. Find values of x which satisfy the equation

$$e^x + 12e^{-x} = 7. \quad (6)$$

4. Given that A and B are both obtuse angles and that $\sin A = \frac{3}{5}$ and $\sin B = \frac{5}{13}$, find the exact values of $\sin(A - B)$ and $\tan(A + B)$. (7)
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5. (a) Find the coordinates of the turning point on the curve $y = xe^x$.

(b) Determine whether it is a maximum or a minimum point. (8)

6. Given $f(x) = x^2 - 6x + 7$ show that:

(a) $f(x) = 0$ has a solution $x = \alpha$ such that $1 < \alpha < 2$. (2)

(b) $x^2 - 6x + 7 = 0$ can be rearranged to give $x = \frac{7}{6 - x}$. (2)

(c) Using the iteration $x_{n+1} = \frac{7}{6 - x_n}$, with $x_0 = 2$, find the values of $x_1, x_2, x_3, x_4, x_5, x_6$ and hence find α to 3 significant figures. (3)

7. (a) Given $x = \cos 3y$, find $\frac{dy}{dx}$ in terms of y . (3)

(b) Hence find the equation of the tangent to the curve $x = \cos 3y$ at the point where $y = \frac{\pi}{6}$. Express your answer in the form $Ay + Bx + C = 0$, where A, B and C are constants. (5)

8. (a) Solve the equation

$$\frac{3}{x^2 + 5x + 6} - \frac{2}{x + 3} = \frac{1}{x + 2}. \quad (5)$$

(b) Simplify $\frac{4x^2 - 9}{x^3 + 1} \times \frac{x + 1}{2x^2 - 7x - 15}.$ (4)

9. (a) Show that $x = 1$ is a solution of the equation

$$x^3 - x^2 - 3x + 3 = 0,$$

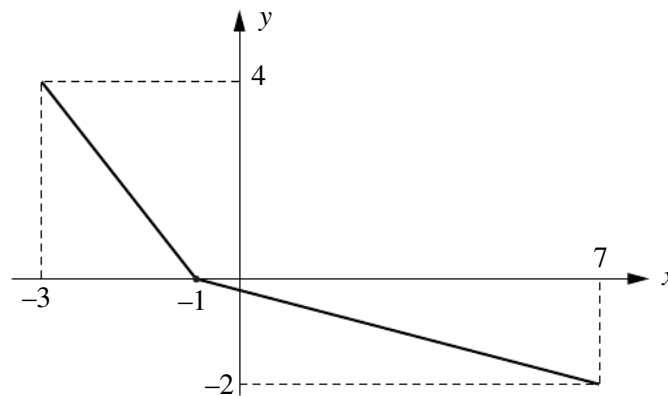
and find the other two values of x which satisfy this equation. (4)

(b) Use part (a) to show that $\tan \theta = 1$ is a solution of the equation

$$\tan^3 \theta - 3 \tan \theta + 4 = \sec^2 \theta \quad \dots(A) \quad (2)$$

(c) Find all the values of θ satisfying equation (A) given that $0 \leq \theta \leq \pi.$ (4)

10.



The diagram shows a sketch of the one-one function g defined over the domain $-3 \leq x \leq 7.$

(a) Sketch the graph of the inverse function g^{-1} and state its domain. (3)

The function h is defined by $h: x \mapsto 2g(x - 1).$

(b) Sketch the graph of the function h and state its range. (3)

(c) Using your graphs or otherwise find the value of $hg(-3).$ (3)

END

TOTAL 75 MARKS