

# Core Mathematics C3 Advanced Level

# For Edexcel

## Paper A

**Time: 1 hour 30 minutes**

### *Instructions and Information*

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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*

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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)

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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.

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3. Find values of  $x$  which satisfy the equation

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

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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)

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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  $\alpha$  to 3 significant figures. (3)

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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)

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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)

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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)

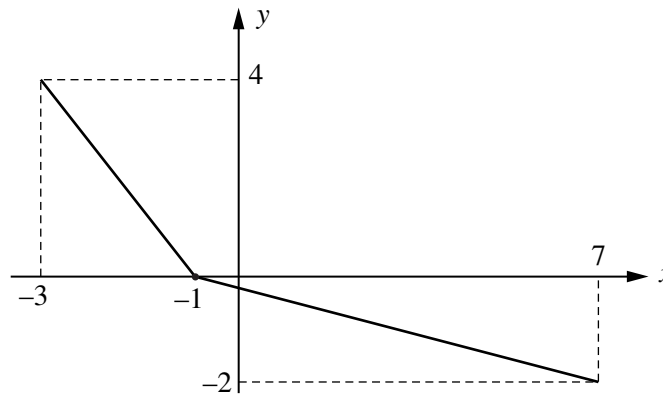
(b) Use part (a) to show that  $\tan \theta = 1$  is a solution of the equation

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

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

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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)

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END

TOTAL 75 MARKS