# Core Mathematics C3       For Edexcel
# Advanced Level

## 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.

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

   $g^{-1}(x) = f(x)$ 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

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

   _____

4. Given that A and B are both obtuse angles and that $\sin A = \dfrac{3}{5}$ and $\sin B = \dfrac{5}{13}$, 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 $x = \dfrac{7}{6 - x}$. **(2)**

   (c) Using the iteration $x_{n+1} = \dfrac{7}{6 - x_n}$, 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 $\dfrac{dy}{dx}$ in terms of y. **(3)**

   (b) Hence find the equation of the tangent to the curve $x = \cos 3y$ at the point where $y = \dfrac{\pi}{6}$. 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

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

**(5)**

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

**(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

$$\tan^3 \theta - 3 \tan \theta + 4 = \sec^2 \theta \qquad \text{…(A)}$$

**(2)**

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

**(4)**

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**10.**
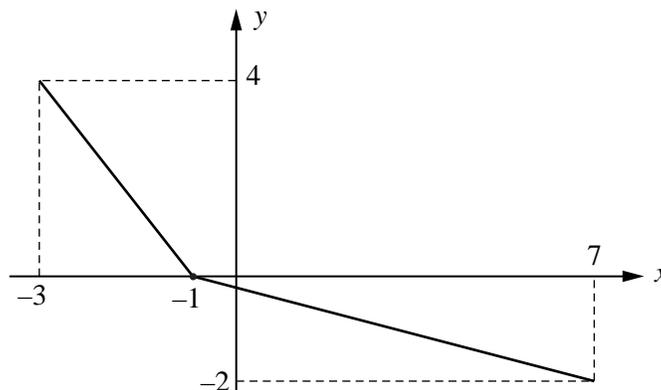


The diagram shows a sketch of the one-one function g defined over the domain $-3 \leq x \leq 7$.

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

**(3)**

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

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

**(3)**

(*c*) Using your graphs or otherwise find the value of $\text{hg}(-3)$.

**(3)**

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**END**         **TOTAL 75 MARKS**