

GCE Examinations
Advanced / Advanced Subsidiary

Core Mathematics C1

Paper B

Time: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- 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 not permitted to use a calculator in this paper.**

INFORMATION FOR CANDIDATES

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



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1. Find the set of values of the constant k such that the equation

$$x^2 - 6x + k = 0$$

has real and distinct roots. [3]

2. The points A , B and C have coordinates $(-3, 0)$, $(5, -2)$ and $(4, 1)$ respectively.

Find an equation for the straight line which passes through C and is parallel to AB .
Give your answer in the form $ax + by = c$, where a , b and c are integers. [4]

3. (i) Express $\frac{18}{\sqrt{3}}$ in the form $k\sqrt{3}$. [2]

(ii) Express $(1 - \sqrt{3})(4 - 2\sqrt{3})$ in the form $a + b\sqrt{3}$ where a and b are integers. [2]

4. Solve the inequality

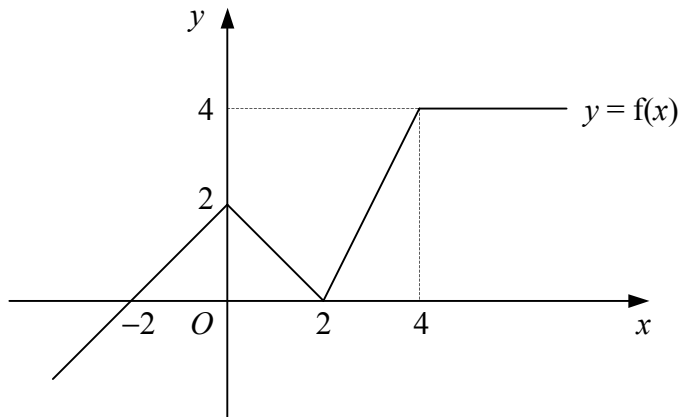
$$2x^2 - 9x + 4 < 0. [4]$$

5. Given that

$$(x^2 + 2x - 3)(2x^2 + kx + 7) \equiv 2x^4 + Ax^3 + Bx^2 + Cx - 21,$$

find the values of the constants k , A and B . [7]

6.



The diagram shows the graph of $y = f(x)$.

(a) Write down the number of solutions that exist for the equation

(i) $f(x) = 1$, [1]

(ii) $f(x) = -x$. [1]

(b) Labelling the axes in a similar way, sketch on separate diagrams the graphs of

(i) $y = f(x - 2)$, [3]

(ii) $y = f(2x)$. [3]

7.

$$f(x) = x^3 - 9x^2.$$

(i) Find $f'(x)$. [2]

(ii) Find $f''(x)$. [1]

(iii) Find the coordinates of the stationary points of the curve $y = f(x)$. [4]

(iv) Determine whether each stationary point is a maximum or a minimum point. [2]

Turn over

8. $f(x) = 9 + 6x - x^2$.

(i) Find the values of A and B such that

$$f(x) = A - (x + B)^2. \quad [4]$$

(ii) State the maximum value of $f(x)$. [1]

(iii) Solve the equation $f(x) = 0$, giving your answers in the form $a + b\sqrt{2}$ where a and b are integers. [3]

(iv) Sketch the curve $y = f(x)$. [2]

9. The circle C has centre $(-3, 2)$ and passes through the point $(2, 1)$.

(i) Find an equation for C . [4]

(ii) Show that the point with coordinates $(-4, 7)$ lies on C . [1]

(iii) Find an equation for the tangent to C at the point $(-4, 7)$. Give your answer in the form $ax + by + c = 0$, where a , b and c are integers. [5]

10. A curve has the equation $y = (\sqrt{x} - 3)^2$, $x \geq 0$.

(i) Show that $\frac{dy}{dx} = 1 - \frac{3}{\sqrt{x}}$. [4]

The point P on the curve has x -coordinate 4.

(ii) Find an equation for the normal to the curve at P in the form $y = mx + c$. [5]

(iii) Show that the normal to the curve at P does not intersect the curve again. [4]