

Core Mathematics C1 Advanced Subsidiary

For Edexcel

Paper E

Time: 1 hour 30 minutes

Instructions and Information

Candidates may NOT use a calculator in this paper.

Full marks may be obtained for answers to ALL questions.

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

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. Solve the equations, for $x > 0$

(a) $x^{\frac{1}{3}} = 2$ (1)

(b) $x^{-2} = \frac{1}{16}$ (1)

(c) $(x^8)^{\frac{1}{2}} = 81$ (1)

2. The number x satisfies the equation

$$x^2 + kx + 25 = 0$$

where k is a constant.

Find the values of k for which this equation has:

(a) equal roots; (2)

(b) two distinct real roots; (2)

(c) no real roots. (2)

3. (a) Express $\sqrt{45}$ in the form $a\sqrt{5}$, where a is an integer. (1)

(b) Express $(3 - \sqrt{5})^2$ in the form $b + c\sqrt{5}$, where b and c are integers. (3)

(c) Given $f(x) = (2 + \sqrt{x})^2 + (1 - 2\sqrt{x})^2$,
expand the brackets and write $f(x)$ in its simplest form. (3)

4. An arithmetic series has a common difference of -2 .

Given that the sum of the first 10 terms of the series is 910, find

(a) the first term of the series, (3)

(b) the value of n , given that the sum of the first n terms of the series is zero. (4)

5. (a) Solve the equation

$$5x^2 = 3x + 2. \quad (3)$$

(b) Multiply $(2x^2 - x - 1)$ by $(3 - 2x)$, arranging your answer in ascending powers of x . (3)

6. The curve C with equation $y = f(x)$ is such that

$$\frac{dy}{dx} = 4x + \frac{4}{\sqrt{x}}, \quad x > 0$$

(a) Show that, when $x = 2$, the exact value of $\frac{dy}{dx}$ is $8 + 2\sqrt{2}$. (3)

The curve C passes through the point $(4, 50)$.

(b) Using integration, find $f(x)$. (6)

7.

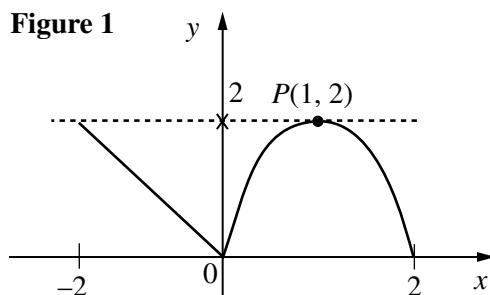


Figure 1 shows the graph of $y = f(x)$ for $-2 \leq x \leq 2$.

Outside this interval $f(x)$ is zero.

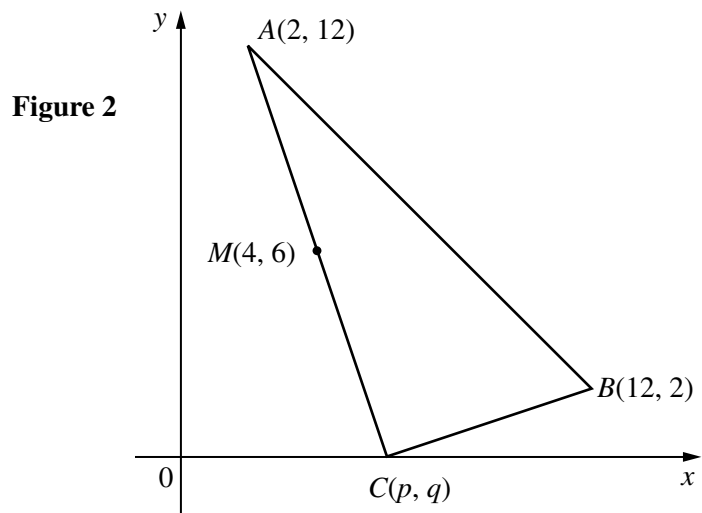
(a) Sketch, on separate diagrams, the following graphs. On each graph label the image of the point P , giving its coordinates

(i) $y = 2f(x)$ (2)

(ii) $y = f(x - 1)$ (2)

(b) The graph of $y = f(-x)$ is obtained from the graph of $y = f(x)$ by a single transformation. Describe fully the transformation. (2)

8.



The points $A(2, 12)$, $B(12, 2)$ and $C(p, q)$ form the vertices of a triangle ABC , as shown in Figure 2. The point $M(4, 6)$ is the mid-point of AC .

- (a) Find the value of p and the value of q . (2)

The line l , which passes through M and is perpendicular to AC , intersects AB at N .

- (b) Find an equation for l , in the form $ax + by + c = 0$, where a , b and c are integers. (5)

The line AB has equation $x + y = 12$.

- (c) Find the exact coordinates of N . (2)

9. The curve C has equation $y = f(x)$ and the point $P(2, 4)$ lies on C .

Given that

$$f'(x) = 6x^2 - 4x - 7$$

- (a) find $f(x)$. (4)

- (b) Verify that the point $(1, 3)$ lies on C . (2)

The point Q also lies on C , and the tangent to C at Q is parallel to the tangent to C at P .

- (c) Find the x -coordinate of Q . (5)

10. The curve C has equation

$$y = 2x^3 - 7x + \frac{4}{x}, \quad x \neq 0.$$

The point A with coordinates $(1, -1)$ lies on C .

(a) Show that the gradient of C at A is -5 . (2)

(b) Show that an equation for the normal to C at A is

$$5y = x - 6 \quad (4)$$

The normal to C at A meets the y -axis at the point P .

(c) Find the coordinates of P . (1)

(d) Find the coordinates of another point on C at which the gradient is -5 . (4)

END

TOTAL 75 MARKS