

# Core Mathematics C1

## Advanced Subsidiary

### Paper E

**Time: 1 hour 30 minutes**

#### *Instructions and Information*

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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*

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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. 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)

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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)

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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)

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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)

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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)

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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)

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7.

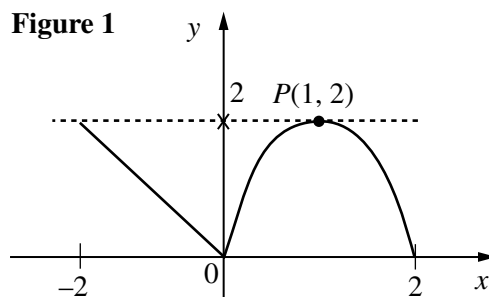


Figure 1 shows the graph of  $y = f(x)$  for  $-2 \leq x \leq 2$ .

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

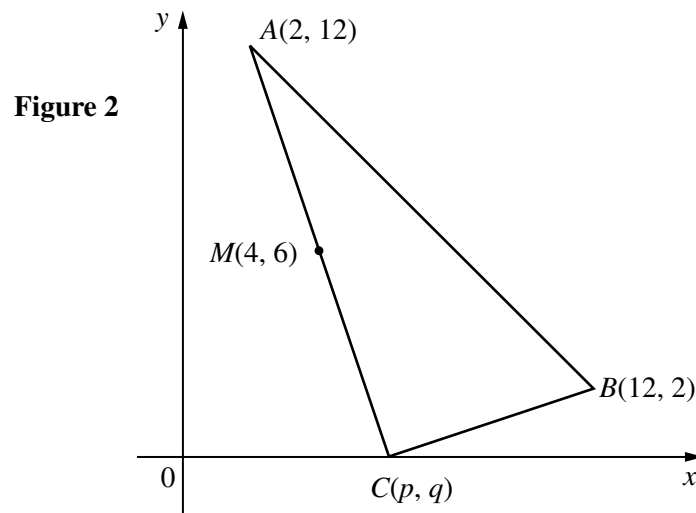
(i)  $y = 2f(x)$  (2)

(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)

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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

$$5y = x - 6$$
(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)

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**END**

**TOTAL 75 MARKS**