

GCE Examinations  
Advanced Subsidiary

# Core Mathematics C1

Paper D

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.

Mathematical formulae and statistical tables are available.

This paper has ten questions.

## *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. Express  $\sqrt{50} + 3\sqrt{8}$  in the form  $k\sqrt{2}$ . (3)
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2. Differentiate with respect to  $x$

$$3x^2 - \sqrt{x} + \frac{1}{2x}. \quad (4)$$

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3. A sequence is defined by the recurrence relation

$$u_{n+1} = u_n - 2, \quad n > 0, \quad u_1 = 50.$$

- (a) Write down the first four terms of the sequence. (1)

- (b) Evaluate

$$\sum_{r=1}^{20} u_r. \quad (3)$$

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4. (a) Find the value of the constant  $k$  such that the equation

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

has equal roots. (2)

- (b) Solve the inequality

$$2x^2 - 9x + 4 < 0. \quad (4)$$

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5. Solve the simultaneous equations

$$x + y = 2$$

$$3x^2 - 2x + y^2 = 2 \quad (7)$$

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6. Given that

$$\frac{dy}{dx} = 3\sqrt{x} - x^2,$$

and that  $y = \frac{2}{3}$  when  $x = 1$ , find the value of  $y$  when  $x = 4$ . (7)

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7. The first three terms of an arithmetic series are  $(12 - p)$ ,  $2p$  and  $(4p - 5)$  respectively, where  $p$  is a constant.

(a) Find the value of  $p$ . (2)

(b) Show that the sixth term of the series is 50. (3)

(c) Find the sum of the first 15 terms of the series. (2)

(d) Find how many terms of the series have a value of less than 400. (3)

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8.  $f(x) = 2x^2 + 3x - 2$ .

(a) Solve the equation  $f(x) = 0$ . (2)

(b) Sketch the curve with equation  $y = f(x)$ , showing the coordinates of any points of intersection with the coordinate axes. (2)

(c) Find the coordinates of the points where the curve with equation  $y = f(\frac{1}{2}x)$  crosses the coordinate axes. (3)

When the graph of  $y = f(x)$  is translated by 1 unit in the positive  $x$ -direction it maps onto the graph with equation  $y = ax^2 + bx + c$ , where  $a$ ,  $b$  and  $c$  are constants.

(d) Find the values of  $a$ ,  $b$  and  $c$ . (3)

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*Turn over*

9.

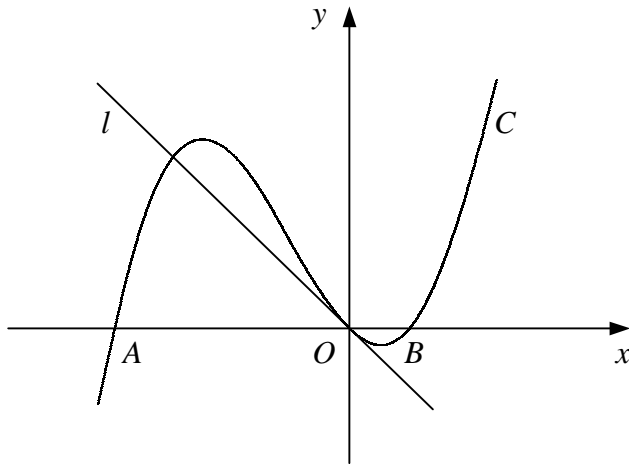
**Figure 1**

Figure 1 shows the curve  $C$  with the equation  $y = x^3 + 3x^2 - 4x$  and the straight line  $l$ .

The curve  $C$  crosses the  $x$ -axis at the origin,  $O$ , and at the points  $A$  and  $B$ .

(a) Find the coordinates of  $A$  and  $B$ . (3)

The line  $l$  is the tangent to  $C$  at  $O$ .

(b) Find an equation for  $l$ . (4)

(c) Find the coordinates of the point where  $l$  intersects  $C$  again. (4)

**10.** The straight line  $l_1$  has equation  $2x + y - 14 = 0$  and crosses the  $x$ -axis at the point  $A$ .

(a) Find the coordinates of  $A$ . (2)

The straight line  $l_2$  is parallel to  $l_1$  and passes through the point  $B(-6, 6)$ .

(b) Find an equation for  $l_2$  in the form  $y = mx + c$ . (3)

The line  $l_2$  crosses the  $x$ -axis at the point  $C$ .

(c) Find the coordinates of  $C$ . (1)

The point  $D$  lies on  $l_1$  and is such that  $CD$  is perpendicular to  $l_1$ .

(d) Show that  $D$  has coordinates  $(5, 4)$ . (5)

(e) Find the area of triangle  $ACD$ . (2)

**END**