

GCE Examinations  
Advanced Subsidiary

## Core Mathematics C2

Paper F

Time: 1 hour 30 minutes

### *Instructions and Information*

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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.

Mathematical formulae and statistical tables are available.

This paper has nine 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.

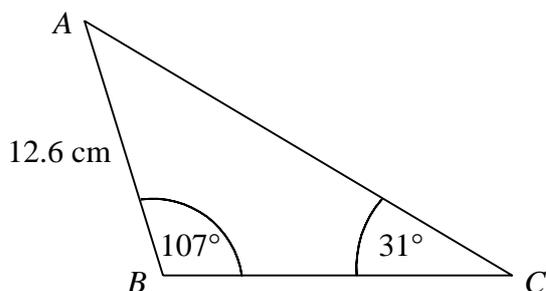


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1.



**Figure 1**

Figure 1 shows triangle  $ABC$  in which  $AB = 12.6$  cm,  $\angle ABC = 107^\circ$  and  $\angle ACB = 31^\circ$ .

Find, to 3 significant figures,

(a) the length  $BC$ , (3)

(b) the area of triangle  $ABC$ . (2)

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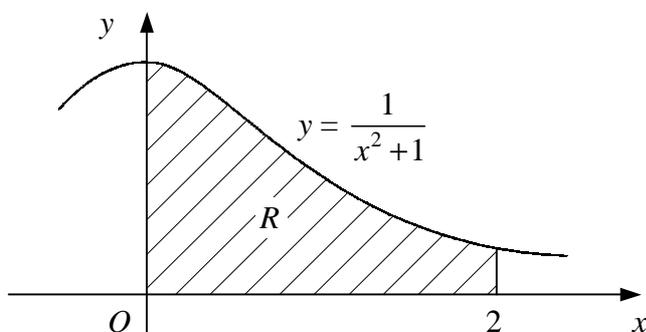
2. Show that

$$\int_2^3 \left( 6\sqrt{x} - \frac{4}{\sqrt{x}} \right) dx = k\sqrt{3},$$

where  $k$  is an integer to be found. (6)

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3.



**Figure 2**

Figure 2 shows the curve with equation  $y = \frac{1}{x^2 + 1}$ .

The shaded region  $R$  is bounded by the curve, the coordinate axes and the line  $x = 2$ .

(a) Use the trapezium rule with four strips of equal width to estimate the area of  $R$ . (5)

The cross-section of a support for a bookshelf is modelled by  $R$  with 1 unit on each axis representing 8 cm. Given that the support is 2 cm thick,

(b) find an estimate for the volume of the support. (2)

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4. (a) Expand  $(2 + y)^6$  in ascending powers of  $y$  as far as the term in  $y^3$ , simplifying each coefficient. (4)

(b) Hence expand  $(2 + x - x^2)^6$  in ascending powers of  $x$  as far as the term in  $x^3$ , simplifying each coefficient. (3)

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5. (a) Given that

$$8 \tan x - 3 \cos x = 0,$$

show that

$$3 \sin^2 x + 8 \sin x - 3 = 0. \quad (3)$$

(b) Find, to 2 decimal places, the values of  $x$  in the interval  $0 \leq x \leq 2\pi$  such that

$$8 \tan x - 3 \cos x = 0. \quad (5)$$


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6. (a) Given that  $y = 3^x$ , find expressions in terms of  $y$  for

(i)  $3^{x+1}$ ,

(ii)  $3^{2x-1}$ . (4)

(b) Hence, or otherwise, solve the equation

$$3^{x+1} - 3^{2x-1} = 6,$$

giving non-exact answers to 2 decimal places. (5)

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7. The circle  $C$  has centre  $(5, 2)$  and passes through the point  $(7, 3)$ .

(a) Find the length of the diameter of  $C$ . (2)

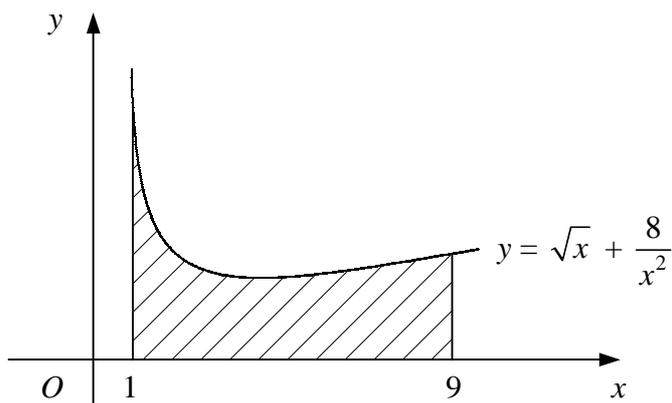
(b) Find an equation for  $C$ . (2)

(c) Show that the line  $y = 2x - 3$  is a tangent to  $C$  and find the coordinates of the point of contact. (5)

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*Turn over*

8.



**Figure 3**

Figure 3 shows the curve with equation  $y = \sqrt{x} + \frac{8}{x^2}$ ,  $x > 0$ .

- (a) Find the coordinates of the minimum point of the curve. (7)
- (b) Show that the area of the shaded region bounded by the curve, the  $x$ -axis and the lines  $x = 1$  and  $x = 9$  is  $24\frac{4}{9}$ . (5)

9. The first three terms of a geometric series are  $(x - 2)$ ,  $(x + 6)$  and  $x^2$  respectively.

- (a) Show that  $x$  must be a solution of the equation

$$x^3 - 3x^2 - 12x - 36 = 0. \quad \text{(I)} \quad \text{(3)}$$

- (b) Verify that  $x = 6$  is a solution of equation (I) and show that there are no other real solutions. (6)

Using  $x = 6$ ,

- (c) find the common ratio of the series, (1)
- (d) find the sum of the first eight terms of the series. (2)

**END**