FOR EDEXCEL

GCE Examinations
Advanced Subsidiary

Core Mathematics C2

Paper H

Time: 1 hour 30 minutes

Instructions and Information

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

You must show sufficient working to make your methods clear to an examiner. Answers without working may gain no credit.

Written by Shaun Armstrong

1. A circle has the equation $x^2 + y^2 - 6y - 7 = 0$.

(a) Find the coordinates of the centre of the circle. **(2)**

(b) Find the radius of the circle. **(2)**

2.

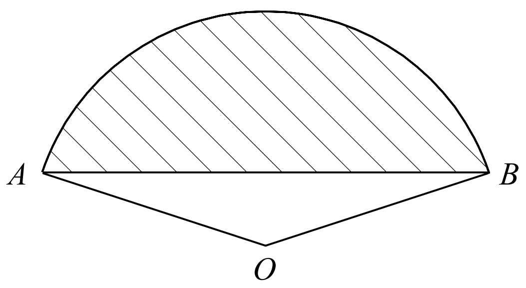

Figure 1

Figure 1 shows the sector OAB of a circle, centre O, in which $\angle AOB = 2.5$ radians.

Given that the perimeter of the sector is 36 cm,

(a) find the length OA, **(2)**

(b) find the area of the shaded segment. **(3)**

3.

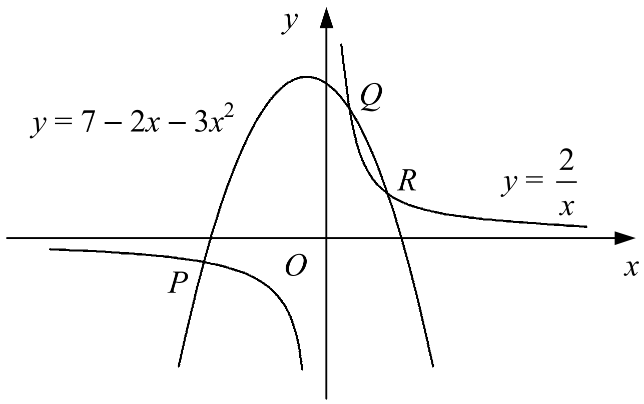

Figure 2

Figure 2 shows the curves with equations $y = 7 - 2x - 3x^2$ and $y = \dfrac{2}{x}$.

The two curves intersect at the points P, Q and R.

(a) Show that the x-coordinates of P, Q and R satisfy the equation

$$3x^3 + 2x^2 - 7x + 2 = 0.$$ **(2)**

Given that P has coordinates $(-2, -1)$,

(b) find the coordinates of Q and R. **(6)**

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4. *(a)* Expand $(1 + x)^4$ in ascending powers of x. **(2)**

(b) Using your expansion, express each of the following in the form $a + b\sqrt{2}$, where a and b are integers.

(i) $(1 + \sqrt{2})^4$

(ii) $(1 - \sqrt{2})^8$ **(7)**

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5. *(a)* Describe fully a single transformation that maps the graph of $y = 3^x$ onto the graph of $y = (\frac{1}{3})^x$. **(1)**

(b) Sketch on the same diagram the curves $y = (\frac{1}{3})^x$ and $y = 2(3^x)$, showing the coordinates of any points where each curve crosses the coordinate axes. **(3)**

The curves $y = (\frac{1}{3})^x$ and $y = 2(3^x)$ intersect at the point P.

(c) Find the x-coordinate of P to 2 decimal places and show that the y-coordinate of P is $\sqrt{2}$. **(5)**

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6. A curve has the equation

$$y = x^3 + ax^2 - 15x + b,$$

where a and b are constants.

Given that the curve is stationary at the point $(-1, 12)$,

(a) find the values of a and b, **(6)**

(b) find the coordinates of the other stationary point of the curve. **(3)**

Turn over

7.

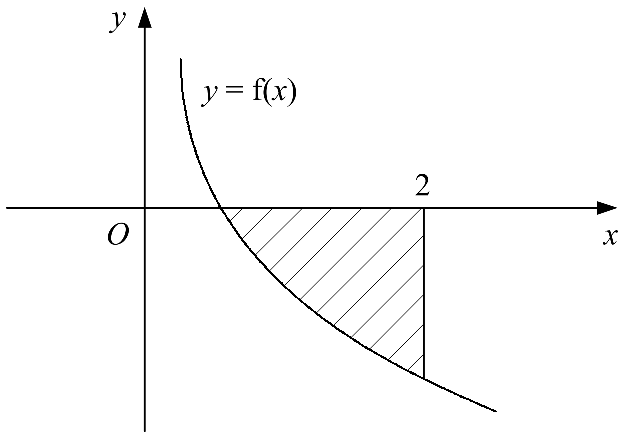

Figure 3

Figure 3 shows part of the curve $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{1-8x^3}{x^2}, \quad x \neq 0.$$

(a) Solve the equation $\mathrm{f}(x) = 0$. **(3)**

(b) Find $\int \mathrm{f}(x)\ \mathrm{d}x$. **(3)**

(c) Find the area of the shaded region bounded by the curve $y = \mathrm{f}(x)$, the x-axis and the line $x = 2$. **(3)**

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8. *(a)* Given that $\sin\theta = 2 - \sqrt{2}$, find the value of $\cos^2\theta$ in the form $a + b\sqrt{2}$ where a and b are integers. **(3)**

(b) Find, in terms of π, all values of x in the interval $0 \leq x < \pi$ for which

$$\cos\left(2x - \tfrac{\pi}{6}\right) = \tfrac{1}{2}.$$ **(7)**

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9. The second and fifth terms of a geometric series are -48 and 6 respectively.

(a) Find the first term and the common ratio of the series. **(5)**

(b) Find the sum to infinity of the series. **(2)**

(c) Show that the difference between the sum of the first n terms of the series and its sum to infinity is given by 2^{6-n}. **(5)**

END