FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C2

Paper L

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 geometric series has first term 75 and second term −15.

(a) Find the common ratio of the series. **(2)**

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

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2. A circle has the equation

$$x^2 + y^2 + 8x - 4y + k = 0,$$

where k is a constant.

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

Given that the x-axis is a tangent to the circle,

(b) find the value of k. **(3)**

3.

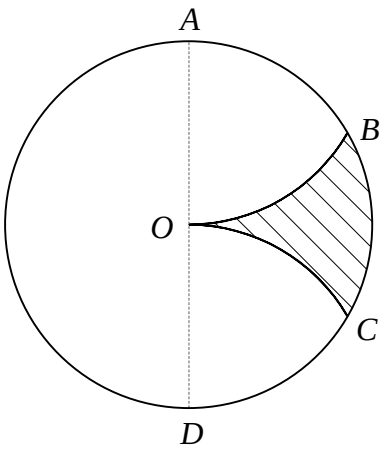

Figure 1

Figure 1 shows a circle of radius r and centre O in which AD is a diameter.

The points B and C lie on the circle such that OB and OC are arcs of circles of radius r with centres A and D respectively.

Show that the area of the shaded region OBC is $\frac{1}{6}r^2(3\sqrt{3} - \pi)$. **(6)**

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4. *(a)* Sketch on the same diagram the graphs of $y = \sin 2x$ and $y = \tan \frac{x}{2}$ for x in the interval $0 \leq x \leq 360°$. **(4)**

(b) Hence state how many solutions exist to the equation

$$\sin 2x = \tan \frac{x}{2},$$

for x in the interval $0 \leq x \leq 360°$ and give a reason for your answer. **(2)**

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5. *(a)* Find the value of a such that

$$\log_a 27 = 3 + \log_a 8.$$ **(3)**

(b) Solve the equation

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

giving your answer to 3 significant figures. **(4)**

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6. *(a)* Expand $(2 + x)^4$ in ascending powers of x, simplifying each coefficient. **(4)**

(b) Find the integers A, B and C such that

$$(2 + x)^4 + (2 - x)^4 \equiv A + Bx^2 + Cx^4.$$ **(2)**

(c) Find the real values of x for which

$$(2 + x)^4 + (2 - x)^4 = 136.$$ **(3)**

7.
$$f(x) = 2x^3 - 5x^2 + x + 2.$$

(a) Show that $(x - 2)$ is a factor of $f(x)$. **(2)**

(b) Fully factorise $f(x)$. **(4)**

(c) Solve the equation $f(x) = 0$. **(1)**

(d) Find the values of θ in the interval $0 \leq \theta \leq 2\pi$ for which

$$2\sin^3\theta - 5\sin^2\theta + \sin\theta + 2 = 0,$$

giving your answers in terms of π. **(4)**

Turn over

8. The curve C has the equation

$$y = 3 - x^{\frac{1}{2}} - 2x^{-\frac{1}{2}}, \quad x > 0.$$

(a) Find the coordinates of the points where C crosses the x-axis. **(4)**

(b) Find the exact coordinates of the stationary point of C. **(5)**

(c) Determine the nature of the stationary point. **(2)**

(d) Sketch the curve C. **(2)**

9.

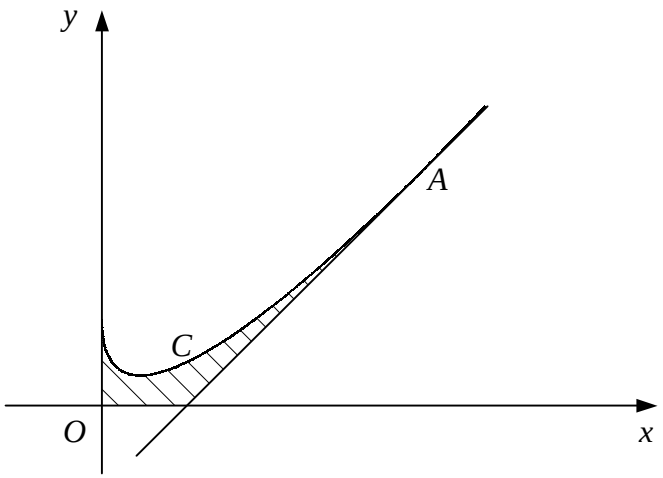

Figure 2

Figure 2 shows the curve C with equation $y = 3x - 4\sqrt{x} + 2$ and the tangent to C at the point A.

Given that A has x-coordinate 4,

(a) show that the tangent to C at A has the equation $y = 2x - 2$. **(6)**

The shaded region is bounded by C, the tangent to C at A and the positive coordinate axes.

(b) Find the area of the shaded region. **(8)**

END