

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel Level 3 GCE

Thursday 16 May 2024

Afternoon (Time: 2 hours)

Paper
reference

8MA0/01

Mathematics

Advanced Subsidiary

PAPER 1: Pure Mathematics

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 14 questions in this question paper. The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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1. Find

$$\int \frac{2\sqrt{x} - 3}{x^2} dx$$

giving your answer in simplest form.

(4)

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5. The curve C_1 has equation

$$y = \frac{6}{x} + 3$$

(a) (i) Sketch C_1 stating the coordinates of any points where the curve cuts the coordinate axes.

(ii) State the equations of any asymptotes to the curve C_1

(3)

The curve C_2 has equation

$$y = 3x^2 - 4x - 10$$

(b) Show that C_1 and C_2 intersect when

$$3x^3 - 4x^2 - 13x - 6 = 0$$

(2)

Given that the x coordinate of one of the points of intersection is $-\frac{2}{3}$

(c) use algebra to find the x coordinates of the other points of intersection between C_1 and C_2

(Solutions relying on calculator technology are not acceptable.)

(4)



8.

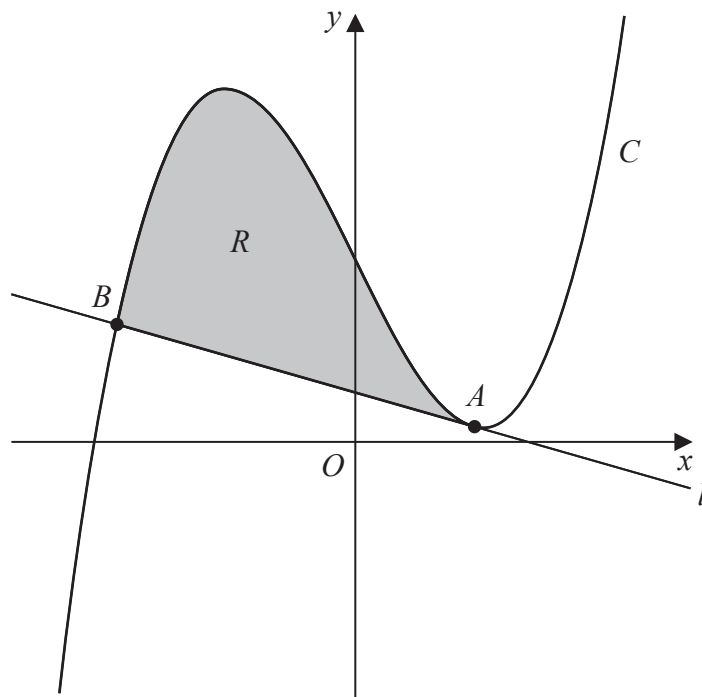


Figure 3

In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

Figure 3 shows a sketch of the curve C with equation

$$y = x^3 - 14x + 23$$

The line l is the tangent to C at the point A , also shown in Figure 3.

Given that l has equation $y = -2x + 7$

- (a) show, using calculus, that the x coordinate of A is 2 (3)

The line l cuts C again at the point B .

- (b) Verify that the x coordinate of B is -4 (2)

The finite region, R , shown shaded in Figure 3, is bounded by C and l .

Using algebraic integration,

- (c) show that the area of R is 108 (5)



9.

$$p = \log_a 16$$

$$q = \log_a 25$$

where a is a constant.

Find in terms of p and/or q ,

(a) $\log_a 256$ (1)

(b) $\log_a 100$ (2)

(c) $\log_a 80 \times \log_a 3.2$ (2)

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10.

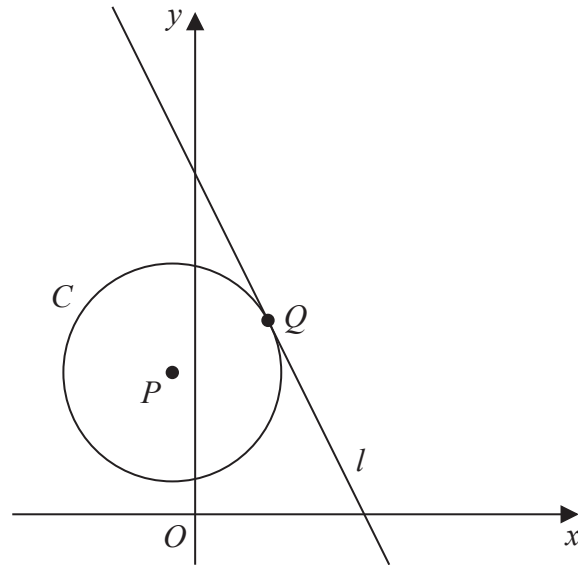


Figure 4

Figure 4 shows a sketch of the circle C

- the point $P(-1, k + 8)$ is the centre of C
- the point $Q(3, k^2 - 2k)$ lies on C
- k is a positive constant
- the line l is the tangent to C at Q

Given that the gradient of l is -2

(a) show that

$$k^2 - 3k - 10 = 0 \quad (4)$$

(b) Hence find an equation for C (4)

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Question 11 continued

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(Total for Question 11 is 6 marks)



P 7 4 0 8 7 A 0 3 3 4 4

12.

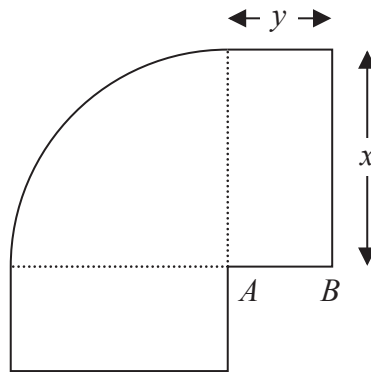


Figure 5

Figure 5 shows the plan view of the design for a swimming pool.

The pool is modelled as a quarter of a circle joined to two equal sized rectangles as shown.

Given that

- the quarter circle has radius x metres
- the rectangles each have length x metres and width y metres
- the total surface area of the swimming pool is 100 m^2

(a) show that, according to the model, the perimeter P metres of the swimming pool is given by

$$P = 2x + \frac{200}{x} \quad (5)$$

(b) Use calculus to find the value of x for which P has a stationary value. (4)

(c) Prove, by further calculus, that this value of x gives a minimum value for P (2)

Access to the pool is by side AB shown in Figure 5.

Given that AB must be at least one metre,

(d) determine, according to the model, whether the swimming pool with the minimum perimeter would be suitable. (2)

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13.

In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

(a) Show that the equation

$$\sin \theta (7 \sin \theta - 4 \cos \theta) = 4$$

can be written as

$$3 \tan^2 \theta - 4 \tan \theta - 4 = 0 \quad (4)$$

(b) Hence solve, for $0 < x < 360^\circ$

$$\sin x (7 \sin x - 4 \cos x) = 4$$

giving your answers to one decimal place. (4)

(c) Hence find the smallest solution of the equation

$$\sin 4\alpha (7 \sin 4\alpha - 4 \cos 4\alpha) = 4$$

in the range $720^\circ < \alpha < 1080^\circ$, giving your answer to one decimal place. (1)



14. Prove, using algebra, that

$$n^2 + 5n$$

is even for all $n \in \mathbb{N}$

(4)

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