

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 International GCSE

Time 2 hours

Paper
reference

4PM1/01R

Further Pure Mathematics PAPER 1R



Calculators may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- 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.
- Check your answers if you have time at the end.

Turn over ►

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International GCSE in Further Pure Mathematics Formulae sheet

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Mensuration

Surface area of sphere = $4\pi r^2$

Curved surface area of cone = $\pi r \times$ slant height

Volume of sphere = $\frac{4}{3}\pi r^3$

Series

Arithmetic series

Sum to n terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

Geometric series

Sum to n terms, $S_n = \frac{a(1 - r^n)}{(1 - r)}$

Sum to infinity, $S_\infty = \frac{a}{1 - r}$ $|r| < 1$

Binomial series

$(1 + x)^n = 1 + nx + \frac{n(n - 1)}{2!}x^2 + \dots + \frac{n(n - 1)\dots(n - r + 1)}{r!}x^r + \dots$ for $|x| < 1, n \in \mathbb{Q}$

Calculus

Quotient rule (differentiation)

$$\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Trigonometry

Cosine rule

In triangle ABC : $a^2 = b^2 + c^2 - 2bc \cos A$

$\tan \theta = \frac{\sin \theta}{\cos \theta}$

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

$\sin(A - B) = \sin A \cos B - \cos A \sin B$

$\cos(A + B) = \cos A \cos B - \sin A \sin B$

$\cos(A - B) = \cos A \cos B + \sin A \sin B$

$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$

$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

Logarithms

$\log_a x = \frac{\log_b x}{\log_b a}$



2 In $\triangle ABC$,

$$\angle BAC = 50^\circ \quad AB = 10 \text{ cm} \quad BC = 9 \text{ cm}$$

Given that $\angle BCA = x^\circ$

find the two possible values, to one decimal place, of x

(3)

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Question 2 continued

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(Total for Question 2 is 3 marks)



3 An arithmetic series has first term 16 and common difference -5

The sum to n terms of this series is S_n

Given that $S_n < -450$

find the least value of n

(4)

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Question 3 continued

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(Total for Question 3 is 4 marks)



Question 4 continued

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(Total for Question 4 is 12 marks)



Question 5 continued

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(Total for Question 5 is 12 marks)



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Question 6 continued

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(Total for Question 6 is 10 marks)



Question 7 continued

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 11 marks)



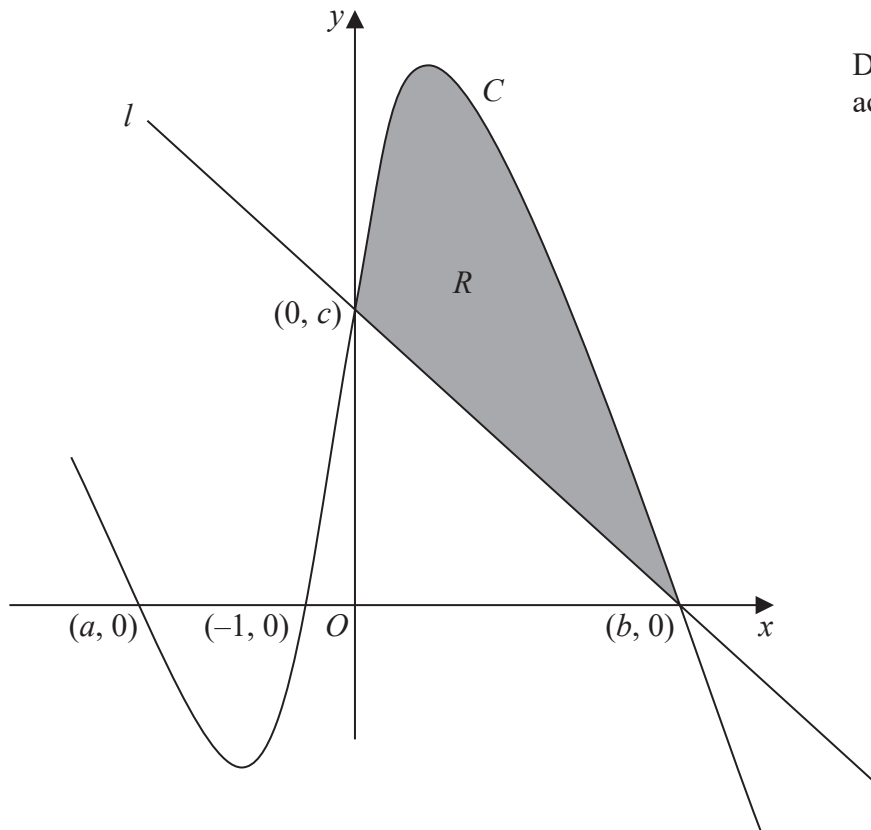


Diagram NOT
accurately drawn

Figure 1

Figure 1 shows part of the curve C with equation $y = f(x)$

The curve C passes through the points with coordinates

$$(a, 0), (-1, 0), (b, 0) \text{ and } (0, c)$$

Given that $f'(x) = 17 + 2x - 3x^2$

(a) show that the equation of C is $y = 15 + 17x + x^2 - x^3$ (4)

(b) Find the value of a , the value of b and the value of c (6)

The straight line l intersects C at the points with coordinates $(b, 0)$ and $(0, c)$

The region R , shown shaded in Figure 1, is bounded by l and C

(c) Use algebraic integration to find the exact area of region R (5)

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Question 8 continued

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Question 8 continued

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Question 8 continued

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(Total for Question 8 is 15 marks)



Question 9 continued

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Question 9 continued

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Question 9 continued

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(Total for Question 9 is 13 marks)



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10 Using formulae from page 2

(a) show that $\cos(A - B) - \cos(A + B) = 2 \sin A \sin B$

(2)

(b) Hence show that $\cos 5\theta - \cos 9\theta = 2 \sin 7\theta \sin 2\theta$

(1)

(c) Solve the equation

$$\cos 5\theta - \cos 9\theta = \sqrt{3} \sin 7\theta \quad \text{for } 0 < \theta \leq \frac{1}{3}\pi$$

Give your solutions in terms of π

(7)

(d) Using calculus and showing your working, evaluate

$$\int_0^{\frac{\pi}{7}} 8 \sin 7x \cos 2x \tan 2x \, dx$$

Give your answer to 3 decimal places.

(6)

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

