

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Tuesday 18 June 2019

Morning (Time: 2 hours 30 minutes)

Paper Reference **WMA02/01**

Mathematics

International Advanced Level

Core Mathematics C34

You must have:

Mathematical Formulae and Statistical Tables (Blue), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. 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 125.
- 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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Pearson

1.

(1)

Question 1 continued

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(Total 7 marks)

Q1



$$\frac{dy}{dx} = \frac{(4x+3)y^{\frac{1}{2}}}{x} \quad x > 0, y > 0$$

giving your answer in the form $y = [g(x)]^2$. (5)

Question 2 continued

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Q2

(Total 7 marks)



- $$x = \sqrt{3} \tan \theta, \quad y = \sec^2 \theta, \quad 0 \leq \theta \leq \frac{\pi}{3}$$

$$y = f(x), \quad 0 \leq x \leq k, \quad \text{where } k \text{ is a constant}$$

- (a) State the value of k . **(1)**
- (b) Find $f(x)$ in its simplest form. **(2)**
- (c) Hence, or otherwise, find the gradient of the curve at the point where $\theta = \frac{\pi}{6}$. **(3)**

Question 3 continued

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(Total 6 marks)

Q3



(5)

(3)

The point P on C has coordinates $(0, 2)$.

(b) Find the equation of the normal to C at P giving your answer in the form $y = mx + c$, where m and c are constants to be found.

Question 4 continued

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(Total 8 marks)

Q4



- (d) Explain why the temperature of the water in the bath cannot fall to 19°C . (1)

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Question 5 continued

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Question 5 continued

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Question 5 continued

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(Total 9 marks)

Q5



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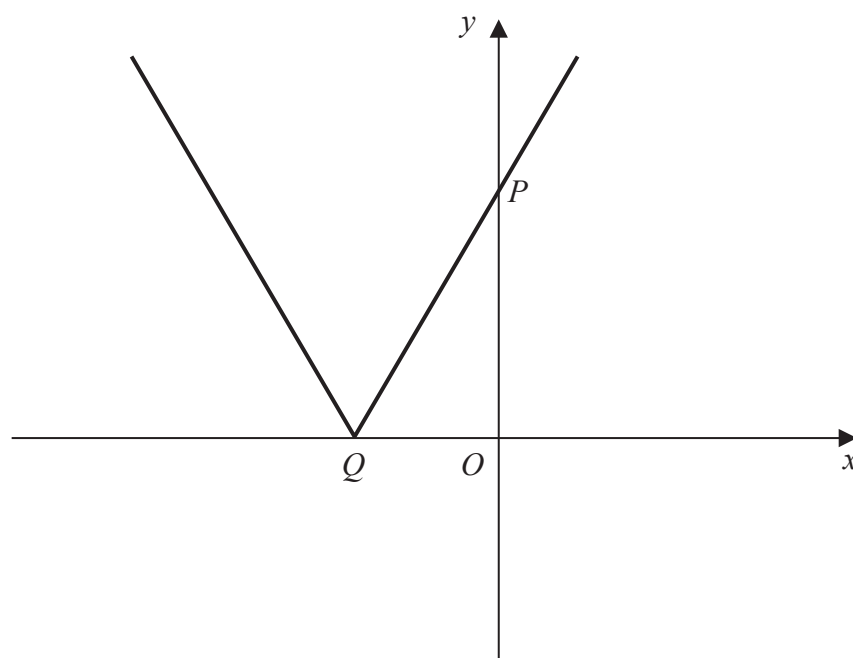


Figure 1

Figure 1 shows a sketch of the graph with equation $y = |4x + 10a|$, where a is a positive constant.

The graph cuts the y -axis at the point P and meets the x -axis at the point Q as shown.

(a) (i) State the coordinates of P .

(ii) State the coordinates of Q .

(2)

(b) A copy of Figure 1 is shown on page 15. On this copy, sketch the graph with equation

$$y = |x| - a$$

Show on the sketch the coordinates of each point where your graph cuts or meets the coordinate axes.

(2)

(c) Hence, or otherwise, solve the equation

$$|4x + 10a| = |x| - a$$

giving your answers in terms of a .

(3)

Question 6 continued

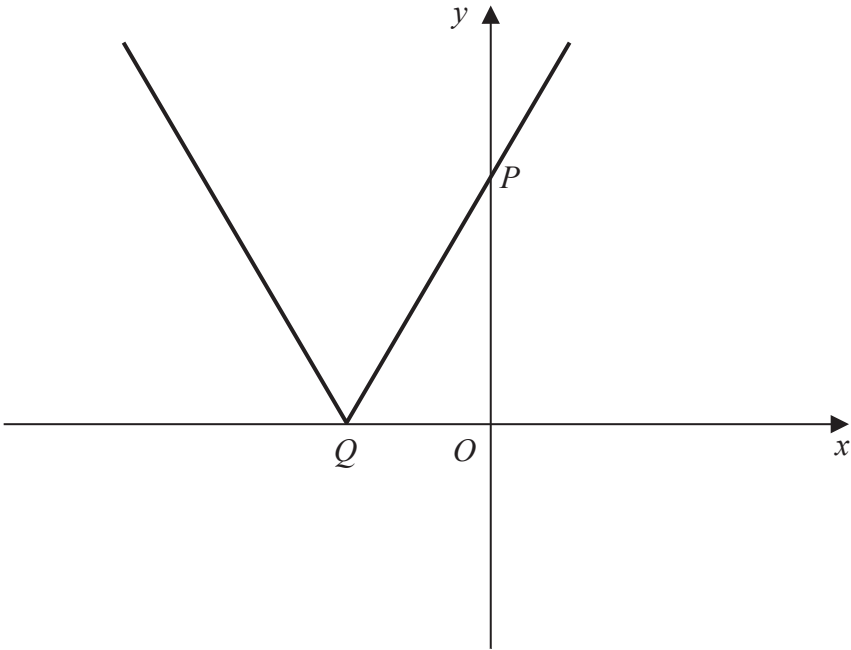


Figure 1

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Question 6 continued

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Q6

(Total 7 marks)



- (3)

(6)

Question 7 continued

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Question 7 continued

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Q7

(Total 9 marks)



8.

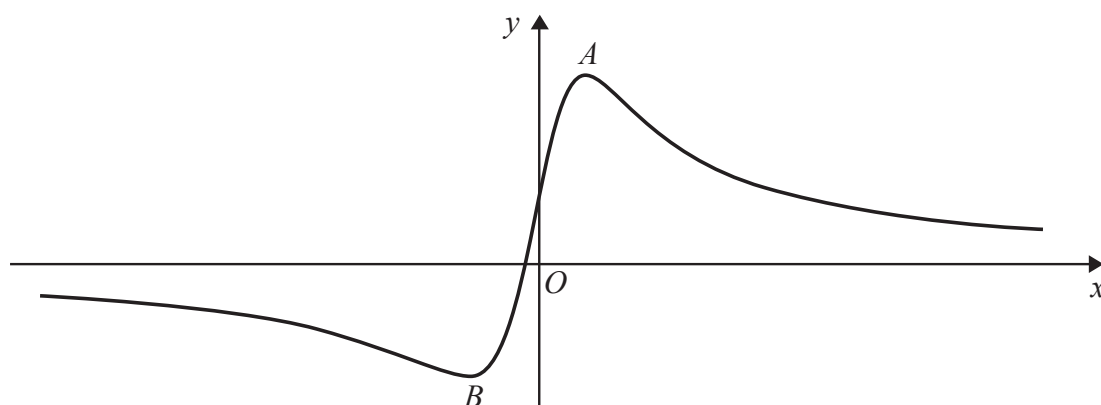


Figure 2

Figure 2 shows a sketch of part of the curve $y = f(x)$, where

$$f(x) = \frac{6x + 2}{3x^2 + 5}, \quad x \in \mathbb{R}$$

- (a) Find $f'(x)$, writing your answer as a single fraction in its simplest form. (3)

The curve has two turning points, a maximum at point A and a minimum at point B , as shown in Figure 2.

- (b) Using part (a), find the coordinates of point A and the coordinates of point B . (4)

- (c) State the coordinates of the maximum turning point of the function with equation

$$y = f(2x) + 4 \quad x \in \mathbb{R} \quad (2)$$

- (d) Find the range of the function

$$g(x) = \frac{6x + 2}{3x^2 + 5}, \quad x \leq 0 \quad (2)$$

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Question 8 continued

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Question 8 continued

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(Total 11 marks)

Q8



- $$\sin(3x) \equiv P \sin x + Q \sin^3 x$$

where P and Q are constants to be determined.

(4)

- $$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \sin 3x \cos x \, dx$$

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(4)

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Question 9 continued

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Question 9 continued

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(Total 8 marks)

Q9



$$\frac{1}{(2+3x)^3} \quad |x| < \frac{2}{3}$$

(5)

(i) $\frac{1}{(2+6x)^3} \quad |x| < \frac{1}{3}$

(4)

Question 10 continued

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Question 10 continued

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Q10

(Total 9 marks)



11. (a) Given

$$\frac{9}{t^2(t-3)} \equiv \frac{A}{t} + \frac{B}{t^2} + \frac{C}{(t-3)}$$

find the value of the constants A , B and C .

(3)

(b)

$$I = \int_4^{12} \frac{9}{t^2(t-3)} dt$$

Find the exact value of I , giving your answer in the form $\ln(a) - b$, where a and b are positive constants.

(6)

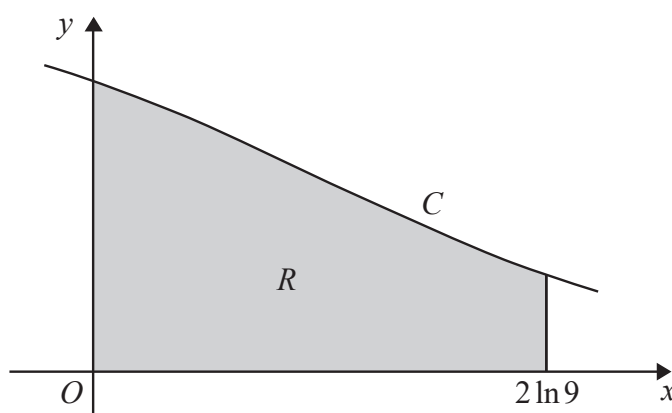


Figure 3

Figure 3 shows a sketch of part of the curve C with parametric equations

$$x = 2 \ln(t-3), \quad y = \frac{6}{t} \quad t > 3$$

The finite region R , shown shaded in Figure 3, is bounded by the curve C , the y -axis, the x -axis and the line with equation $x = 2 \ln 9$

The region R is rotated 360° about the x -axis to form a solid of revolution.

(c) Show that the exact volume of the solid generated is

$$k \times I$$

where k is a constant to be found.

(3)

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Question 11 continued

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Question 11 continued

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Q11

(Total 12 marks)



the point C has position vector $(2\mathbf{i} + 4\mathbf{j} - 3\mathbf{k})$

(d) Hence find the area of triangle CAB , giving your answer to 3 significant figures. (2)

(e) find the two possible position vectors of point D . (3)

Question 12 continued

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Question 12 continued

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Q12

(Total 13 marks)



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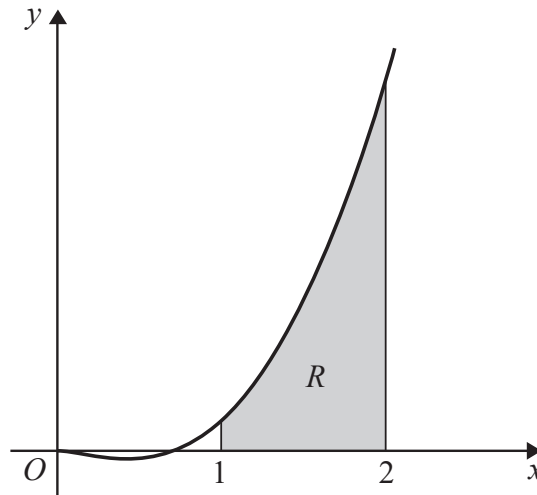


Figure 4

Figure 4 shows a sketch of the curve with equation $y = 12x^2 \ln(2x^2)$, $x > 0$

The finite region R , shown shaded in Figure 4, is bounded by the curve, the line with equation $x = 1$, the x -axis and the line with equation $x = 2$

The table below shows corresponding values of x and y for $y = 12x^2 \ln(2x^2)$, with the values of y given to 3 significant figures.

x	1	1.25	1.5	1.75	2
y	8.32	21.4	40.6	66.6	99.8

- (a) Use the trapezium rule, with all the values of y , to obtain an estimate for the area of R , giving your answer to 2 significant figures. (3)

- (b) Use the substitution $u = x^2$ to show that the area of R is given by

$$\int_1^4 6u^{\frac{1}{2}} \ln(2u) \, du$$
(3)

- (c) Hence, using calculus, find the exact area of R , writing your answer in the form $a + b \ln 2$, where a and b are constants to be found. (6)



Question 13 continued

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Question 13 continued

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Q13

(Total 12 marks)



Question 14 continued

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Question 14 continued

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Q14

Answer box for Q14

(Total 7 marks)

TOTAL FOR PAPER: 125 MARKS

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