

Write your name here

Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Core Mathematics C34

Advanced

Friday 12 June 2015 – Morning

Time: 2 hours 30 minutes

Paper Reference

WMA02/01

You must have:

Mathematical Formulae and Statistical Tables (Blue)

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). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- 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.

Turn over ►

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PEARSON



Question 1 continued

(Total 9 marks)

Q1





Question 2 continued

[illegible]

3.

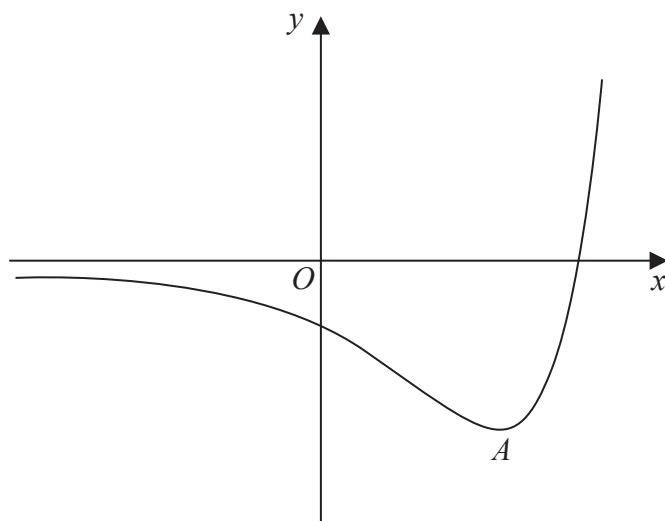


Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = f(x)$, where

$$f(x) = (2x - 5)e^x, \quad x \in \mathbb{R}$$

The curve has a minimum turning point at A .

- (a) Use calculus to find the exact coordinates of A .

(5)

Given that the equation $f(x) = k$, where k is a constant, has exactly two roots,

- (b) state the range of possible values of k .

(2)

- (c) Sketch the curve with equation $y = |f(x)|$.

Indicate clearly on your sketch the coordinates of the points at which the curve crosses or meets the axes.

(3)



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a full page of blank, lined paper. It features approximately 28 horizontal gray lines spaced evenly across the page, typical of notebook paper. The lines are thin and light gray, set against a plain white background. There is no handwriting or other markings on the page.

(Total 10 marks)

Q3



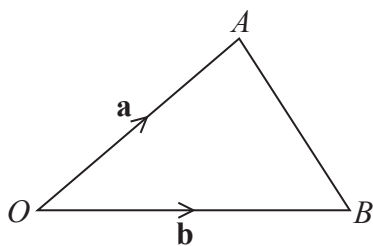


Figure 2

Given that $|\mathbf{a}| = 5$, $|\mathbf{b}| = 6$ and $\mathbf{a} \cdot \mathbf{b} = 20$

- (a) find the cosine of angle AOB , (2)
- (b) find the exact length of AB . (2)
- (c) Show that the area of triangle OAB is $5\sqrt{5}$ (3)



- (4)

(ii) Given that

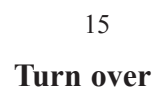
$$\int_a^{2a} \frac{t+1}{t} dt = \ln 7 \quad a > 0$$

find the exact value of the constant a .

(4)



(Total 8 marks)



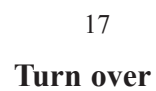
where k is a positive constant.

- Given that the mass is 50 grams, 10 years after first being observed,

- (c) Find the value of t when $m = 20$, giving your answer to the nearest year. (3)

[illegible]

(Total 8 marks)









[illegible]

(Total 8 marks)

Q7





[illegible]

[illegible]

(Total 10 marks)

Q8



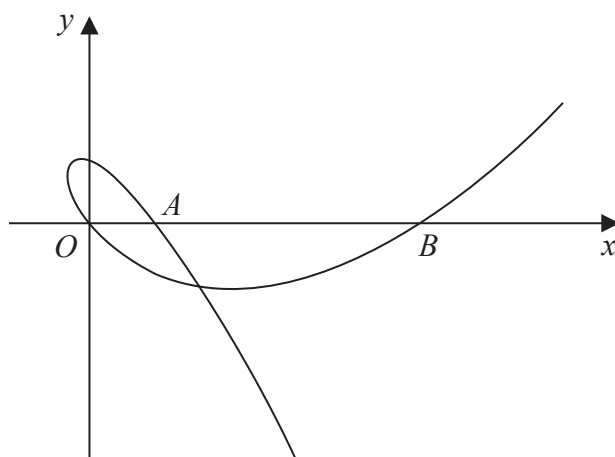


Figure 3

$$x = t^2 + 2t, \quad y = t^3 - 9t, \quad t \in \mathbb{R}$$

(a) Find the coordinates of point A and show that point B has coordinates $(15, 0)$. **(3)**

(b) Show that the equation of the tangent to the curve at B is $9x - 4y - 135 = 0$ (5)

(c) Find the coordinates of X . (5)

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

[illegible]

[illegible]

This image shows a full page of blank, lined paper. It features approximately 28 horizontal grey lines spaced evenly apart, typical of standard notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings present.

(Total 13 marks)

Q9



10.

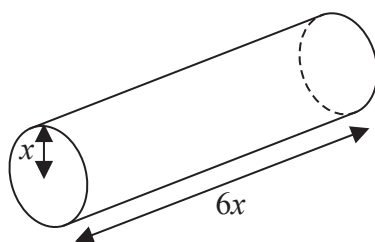


Figure 4

Figure 4 shows a right circular cylindrical rod which is expanding as it is heated.

At time t seconds the radius of the rod is x cm and the length of the rod is $6x$ cm.

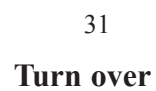
Given that the **cross-sectional area** of the rod is increasing at a constant rate of $\frac{\pi}{20} \text{ cm}^2 \text{ s}^{-1}$, find the rate of increase of the volume of the rod when $x = 2$

Write your answer in the form $k\pi \text{ cm}^3 \text{ s}^{-1}$ where k is a rational number.

(6)



(Total 6 marks)



(3)

$$H = 3 + 1.5 \sin\left(\frac{\pi t}{6}\right) - 1.2 \cos\left(\frac{\pi t}{6}\right), \quad 0 \leq t < 12$$

(4)

(6)

[illegible]



[illegible]

(Total 13 marks)

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[illegible]

[illegible]

(Total 10 marks)



13.

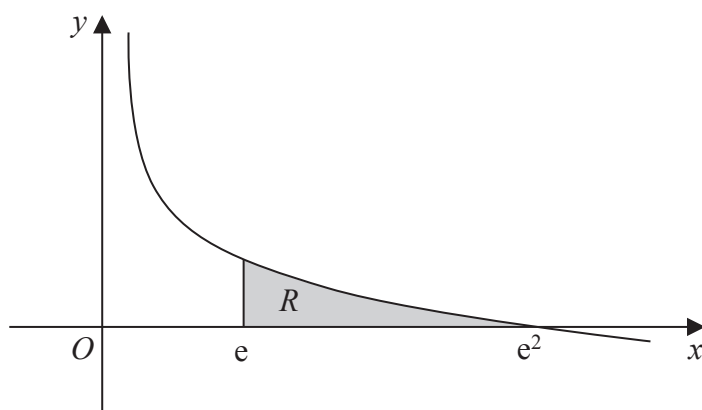


Figure 5

Figure 5 shows a sketch of part of the curve with equation $y = 2 - \ln x$, $x > 0$

The finite region R , shown shaded in Figure 5, is bounded by the curve, the x -axis and the line with equation $x = e$.

The table below shows corresponding values of x and y for $y = 2 - \ln x$

x	e	$\frac{e + e^2}{2}$	e^2
y	1		0

(a) Complete the table giving the value of y to 4 decimal places. (1)

(b) Use the trapezium rule, with all the values of y in the completed table, to obtain an estimate for the area of R , giving your answer to 3 decimal places. (3)

(c) Use integration by parts to show that $\int (\ln x)^2 dx = x (\ln x)^2 - 2x \ln x + 2x + c$ (4)

The area R is rotated through 360° about the x -axis.

(d) Use calculus to find the exact volume of the solid generated.

Write your answer in the form $\pi e(pe + q)$, where p and q are integers to be found. (6)





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(Total 14 marks)

TOTAL FOR PAPER: 125 MARKS

END

