

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel  
Level 3 GCE**

Centre Number

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Candidate Number

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**Wednesday 5 June 2019**

Morning (Time: 2 hours)

Paper Reference **9MA0/01**

**Mathematics**

**Advanced**

**Paper 1: Pure Mathematics 1**

**You must have:**

Mathematical Formulae and Statistical Tables, calculator

Total Marks

**Candidates may use any calculator allowed 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.
- 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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**Question 7 continued**

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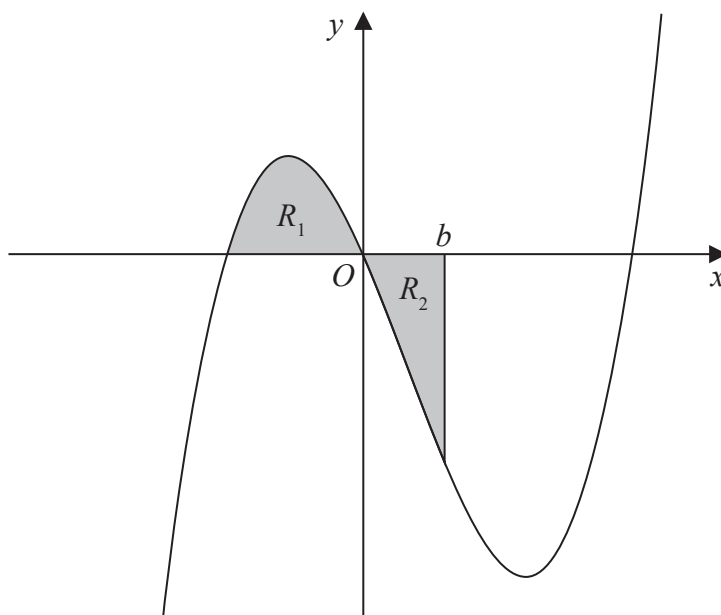


Figure 2

Figure 2 shows a sketch of part of the curve with equation  $y = x(x + 2)(x - 4)$ .

The region  $R_1$  shown shaded in Figure 2 is bounded by the curve and the negative  $x$ -axis.

(a) Show that the exact area of  $R_1$  is  $\frac{20}{3}$  (4)

The region  $R_2$  also shown shaded in Figure 2 is bounded by the curve, the positive  $x$ -axis and the line with equation  $x = b$ , where  $b$  is a positive constant and  $0 < b < 4$

Given that the area of  $R_1$  is equal to the area of  $R_2$

(b) verify that  $b$  satisfies the equation

$$(b + 2)^2 (3b^2 - 20b + 20) = 0 \quad (4)$$

The roots of the equation  $3b^2 - 20b + 20 = 0$  are 1.225 and 5.442 to 3 decimal places. The value of  $b$  is therefore 1.225 to 3 decimal places.

(c) Explain, with the aid of a diagram, the significance of the root 5.442 (2)

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**Question 8 continued**

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Question 10 continued

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(Total for Question 10 is 6 marks)



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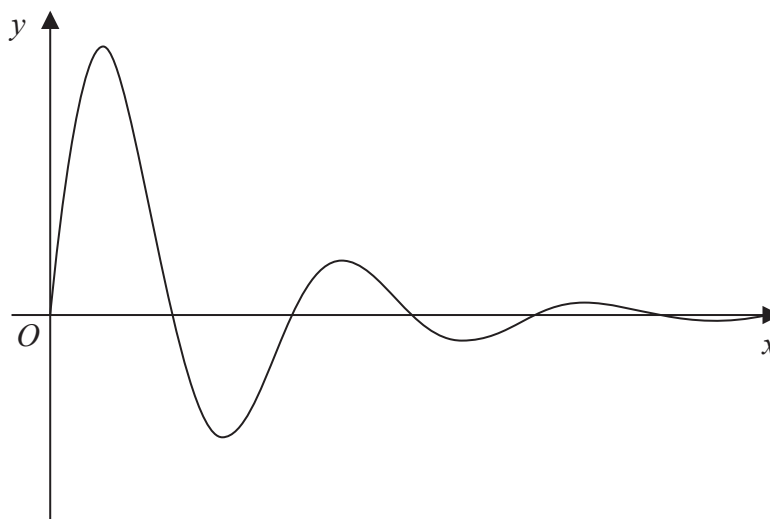




12.  $f(x) = 10e^{-0.25x} \sin x, \quad x \geq 0$

- (a) Show that the  $x$  coordinates of the turning points of the curve with equation  $y = f(x)$  satisfy the equation  $\tan x = 4$

(4)



**Figure 3**

Figure 3 shows a sketch of part of the curve with equation  $y = f(x)$ .

- (b) Sketch the graph of  $H$  against  $t$  where

$$H(t) = |10e^{-0.25t} \sin t| \quad t \geq 0$$

showing the long-term behaviour of this curve.

(2)

The function  $H(t)$  is used to model the height, in metres, of a ball above the ground  $t$  seconds after it has been kicked.

Using this model, find

- (c) the maximum height of the ball above the ground between the first and second bounce.

(3)

- (d) Explain why this model should not be used to predict the time of each bounce.

(1)

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13. The curve  $C$  with equation

$$y = \frac{p - 3x}{(2x - q)(x + 3)} \quad x \in \mathbb{R}, x \neq -3, x \neq 2$$

where  $p$  and  $q$  are constants, passes through the point  $\left(3, \frac{1}{2}\right)$  and has two vertical asymptotes with equations  $x = 2$  and  $x = -3$

(a) (i) Explain why you can deduce that  $q = 4$

(ii) Show that  $p = 15$

(3)

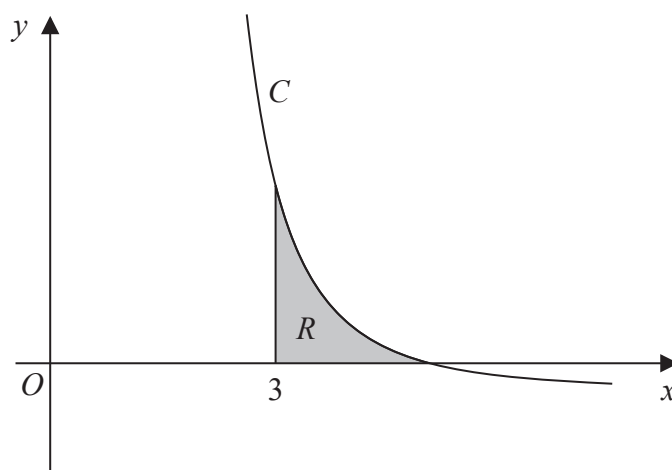


Figure 4

Figure 4 shows a sketch of part of the curve  $C$ . The region  $R$ , shown shaded in Figure 4, is bounded by the curve  $C$ , the  $x$ -axis and the line with equation  $x = 3$

(b) Show that the exact value of the area of  $R$  is  $a \ln 2 + b \ln 3$ , where  $a$  and  $b$  are rational constants to be found.

(8)















