

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel  
Level 3 GCE**

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

**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 ►

P58353A

©2019 Pearson Education Ltd.

1/1/1/1/1/C2/C2/



Pearson

Answer ALL questions. Write your answers in the spaces provided.

1.

$$f(x) = 3x^3 + 2ax^2 - 4x + 5a$$

Given that  $(x + 3)$  is a factor of  $f(x)$ , find the value of the constant  $a$ .

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA













































8.

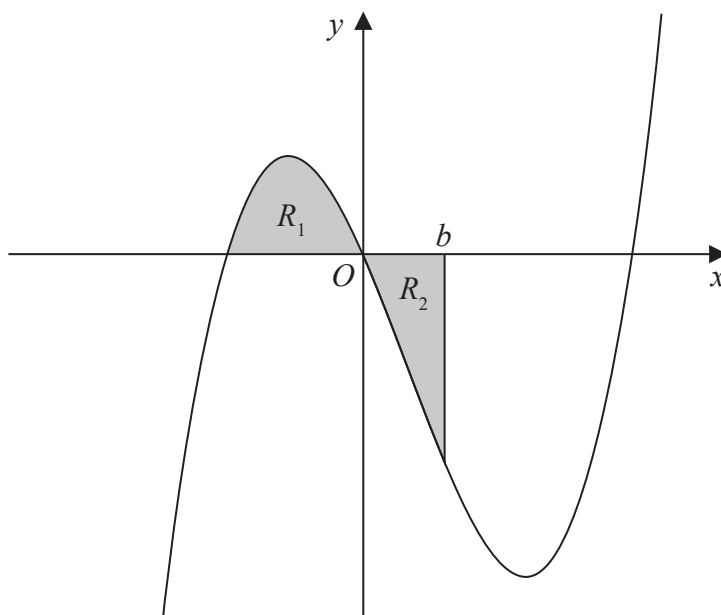


Figure 2

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)

---



---



---



---



---



---



---



























**Question 11 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area consisting of 25 horizontal lines.

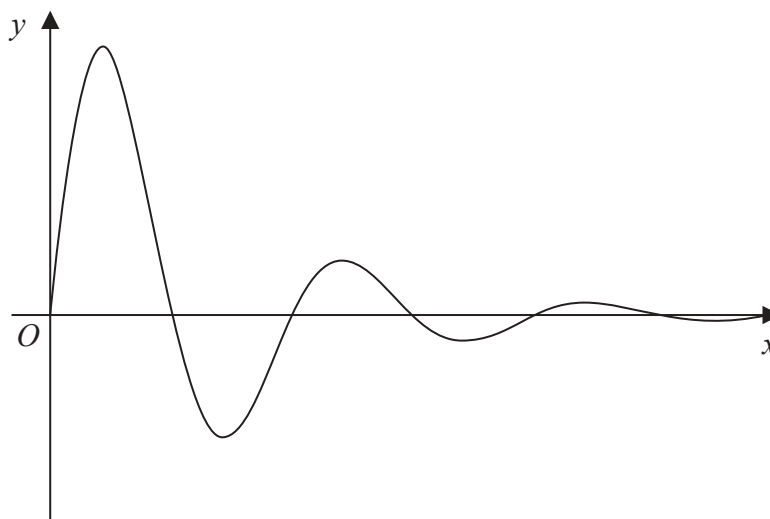
**(Total for Question 11 is 7 marks)**



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)

---



---



---



---



---



---



---





Question 12 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---





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)

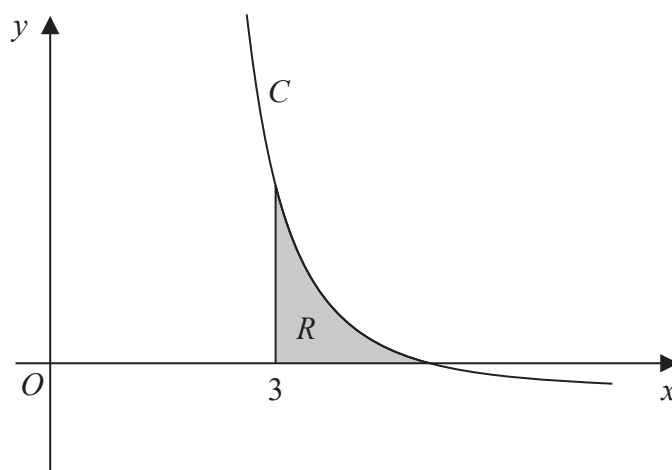


Figure 4

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)











14. The curve  $C$ , in the standard Cartesian plane, is defined by the equation

$$x = 4 \sin 2y \quad -\frac{\pi}{4} < y < \frac{\pi}{4}$$

The curve  $C$  passes through the origin  $O$

(a) Find the value of  $\frac{dy}{dx}$  at the origin. (2)

(b) (i) Use the small angle approximation for  $\sin 2y$  to find an equation linking  $x$  and  $y$  for points close to the origin.

(ii) Explain the relationship between the answers to (a) and (b)(i). (2)

(c) Show that, for all points  $(x, y)$  lying on  $C$ ,

$$\frac{dy}{dx} = \frac{1}{a\sqrt{b-x^2}}$$

where  $a$  and  $b$  are constants to be found. (3)





Question 14 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 14 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS

