

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number				Candidate Number					
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<b>Pearson Edexcel International Advanced Level</b>									
<b>Wednesday 9 October 2024</b>									
Morning (Time: 1 hour 30 minutes)					Paper reference		<b>WMA11/01</b>		
<b>Mathematics</b>									
<b>International Advanced Subsidiary/Advanced Level</b>									
<b>Pure Mathematics P1</b>									
<b>You must have:</b> Mathematical Formulae and Statistical Tables (Yellow), 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 9 questions in this question paper. The total mark for this paper is 75.
- 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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2.

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(i) Simplify fully

$$\frac{3y^3(2x^4)^3}{4x^2y^4} \quad (3)$$

(ii) Find the exact value of  $a$  such that

$$\frac{16}{\sqrt{3} + 1} = a\sqrt{27} + 4$$

Write your answer in the form  $p\sqrt{3} + q$  where  $p$  and  $q$  are fully simplified rational constants.

(4)

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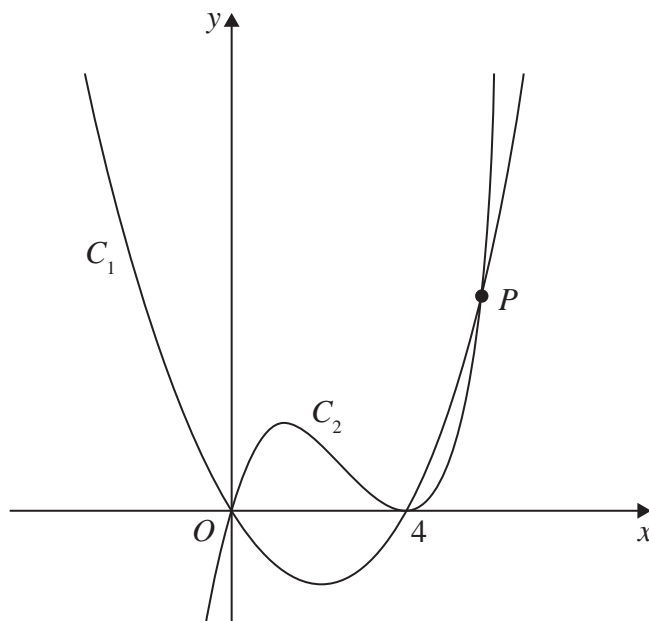


Figure 1

Figure 1 shows a sketch of part of the curves  $C_1$  and  $C_2$

Given that  $C_1$

- has equation  $y = f(x)$  where  $f(x)$  is a quadratic function
- cuts the  $x$ -axis at the origin and at  $x = 4$
- has a minimum turning point at  $(2, -4.8)$

(a) find  $f(x)$

(3)

Given that  $C_2$

- has equation  $y = g(x)$  where  $g(x)$  is a cubic function
- cuts the  $x$ -axis at the origin and meets the  $x$ -axis at  $x = 4$
- passes through the point  $(6, 7.2)$

(b) find  $g(x)$

(3)

The curves  $C_1$  and  $C_2$  meet in the first quadrant at the point  $P$ , shown in Figure 1.

(c) Use algebra to find the coordinates of  $P$ .

(4)

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6. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Sketch the curve  $C$  with equation

$$y = \frac{1}{2-x} \quad x \neq 2$$

State on your sketch

- the equation of the vertical asymptote
- the coordinates of the intersection of  $C$  with the  $y$ -axis

(3)

The straight line  $l$  has equation  $y = kx - 4$ , where  $k$  is a constant.

Given that  $l$  cuts  $C$  at least once,

(b) (i) show that

$$k^2 - 5k + 4 \geq 0$$

(ii) find the range of possible values for  $k$ .

(6)

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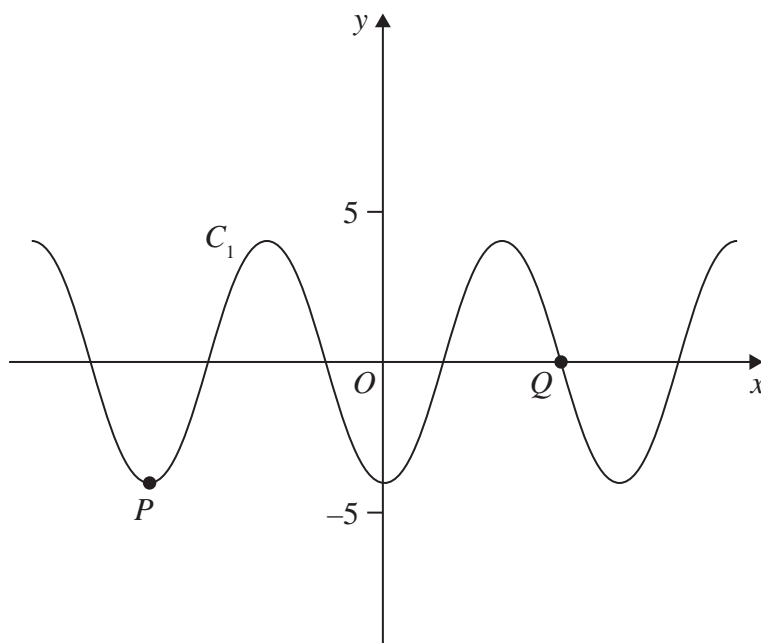


Figure 3

Figure 3 shows a plot of part of the curve  $C_1$  with equation

$$y = -4 \cos x$$

where  $x$  is measured in radians.

Points  $P$  and  $Q$  lie on the curve and are shown in Figure 3.

(a) State

- (i) the coordinates of  $P$
- (ii) the coordinates of  $Q$

(3)

The curve  $C_2$  has equation  $y = -4 \cos x + k$  where  $x$  is measured in radians and  $k$  is a constant.

Given that  $C_2$  has a maximum  $y$  value of 11

- (b) (i) state the value of  $k$
- (ii) state the coordinates of the minimum point on  $C_2$  with the smallest positive  $x$  coordinate.

(3)

On the opposite page there is a copy of Figure 3 labelled Diagram 1.

(c) Using Diagram 1, state the number of solutions of the equation

$$-4 \cos x = 5 - \frac{10}{\pi} x$$

giving a reason for your answer.

(2)

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## Question 7 continued

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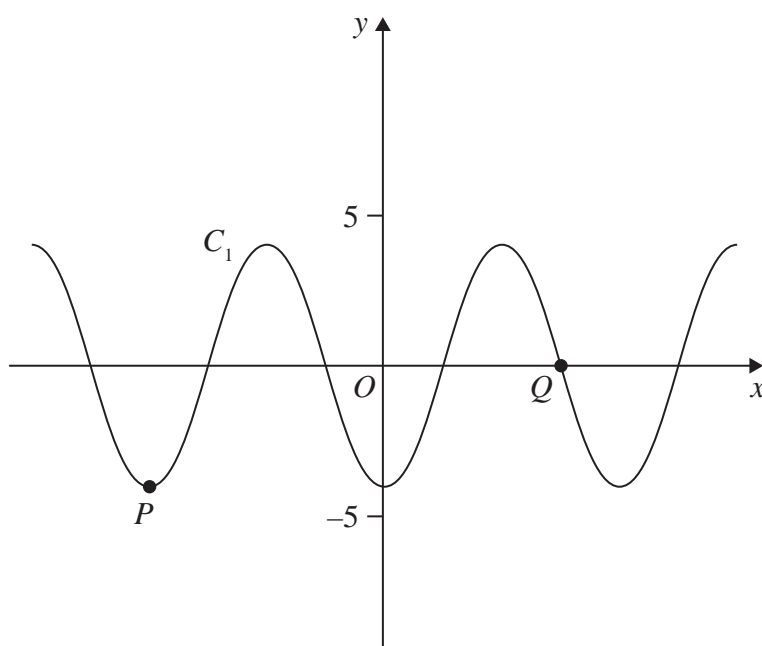


Diagram 1

(Total for Question 7 is 8 marks)



8. A curve  $C$  has equation  $y = f(x)$ .

The point  $P$  with  $x$  coordinate 3 lies on  $C$

Given

- $f'(x) = 4x^2 + kx + 3$  where  $k$  is a constant
- the normal to  $C$  at  $P$  has equation  $y = -\frac{1}{24}x + 5$

(a) show that  $k = -5$

(3)

(b) Hence find  $f(x)$ .

(4)

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9.

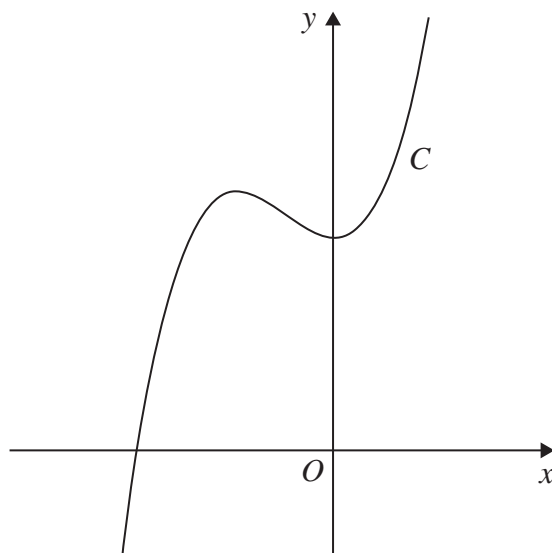


Figure 4

Figure 4 shows a sketch of the curve  $C$  with equation  $y = f(x)$ , where

$$f(x) = (x + 5)(3x^2 - 4x + 20)$$

(a) Deduce the range of values of  $x$  for which  $f(x) \geq 0$  (1)

(b) Find  $f'(x)$  giving your answer in simplest form. (3)

The point  $R(-4, 84)$  lies on  $C$ .

Given that the tangent to  $C$  at the point  $P$  is parallel to the tangent to  $C$  at the point  $R$

(c) find the  $x$  coordinate of  $P$ . (4)

(d) Find the point to which  $R$  is transformed when the curve with equation  $y = f(x)$  is transformed to the curve with equation,

(i)  $y = f(x - 3)$

(ii)  $y = 4f(x)$  (2)

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