

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						6	6	6	4	/	0	1	Signature	

Paper Reference(s)

6664/01

Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Friday 24 May 2013 – Morning
 Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
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2	
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10	
Total	

Materials required for examination Mathematical Formulae (Pink) Items included with question papers Nil

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 or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.
 Answer ALL the questions.
 You must write your answer for each question in the space following the question.
 When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
 Full marks may be obtained for answers to ALL questions.
 The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).
 There are 10 questions in this question paper. The total mark for this paper is 75.
 There are 32 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
 You should show sufficient working to make your methods clear to the Examiner.
 Answers without working may not gain full credit.



1. The first three terms of a geometric series are

18, 12 and p

respectively, where p is a constant.

Find

(a) the value of the common ratio of the series, (1)

(b) the value of p , (1)

(c) the sum of the first 15 terms of the series, giving your answer to 3 decimal places. (2)

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2. (a) Use the binomial theorem to find all the terms of the expansion of

$$(2 + 3x)^4$$

Give each term in its simplest form.

(4)

- (b) Write down the expansion of

$$(2 - 3x)^4$$

in ascending powers of x , giving each term in its simplest form.

(1)



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3.

$$f(x) = 2x^3 - 5x^2 + ax + 18$$

where a is a constant.

Given that $(x - 3)$ is a factor of $f(x)$,

(a) show that $a = -9$

(2)

(b) factorise $f(x)$ completely.

(4)

Given that

$$g(y) = 2(3^{3y}) - 5(3^{2y}) - 9(3^y) + 18$$

(c) find the values of y that satisfy $g(y) = 0$, giving your answers to 2 decimal places where appropriate.

(3)



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Question 3 continued

Lined area for writing the answer to Question 3.



4.
$$y = \frac{5}{(x^2 + 1)}$$

(a) Complete the table below, giving the missing value of y to 3 decimal places.

x	0	0.5	1	1.5	2	2.5	3
y	5	4	2.5		1	0.690	0.5

(1)

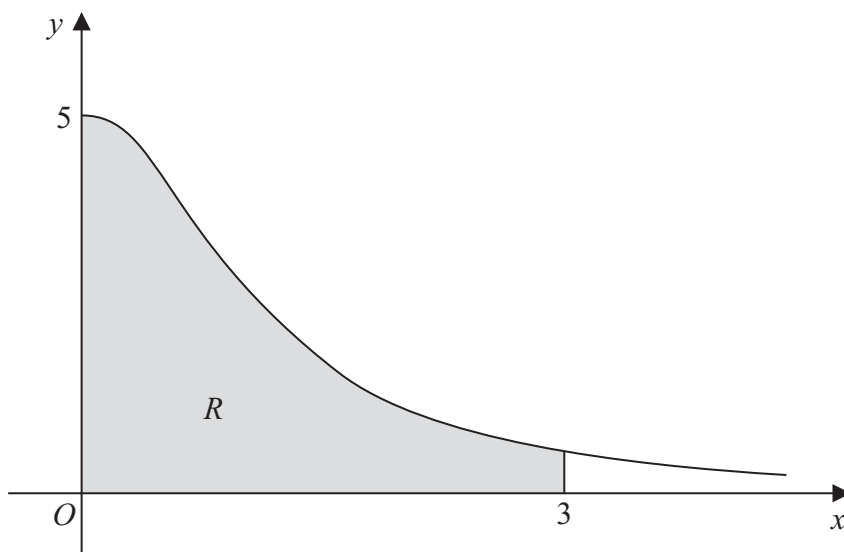


Figure 1

Figure 1 shows the region R which is bounded by the curve with equation $y = \frac{5}{(x^2 + 1)}$, the x -axis and the lines $x = 0$ and $x = 3$

(b) Use the trapezium rule, with all the values of y from your table, to find an approximate value for the area of R .

(4)

(c) Use your answer to part (b) to find an approximate value for

$$\int_0^3 \left(4 + \frac{5}{(x^2 + 1)} \right) dx$$

giving your answer to 2 decimal places.

(2)



5.

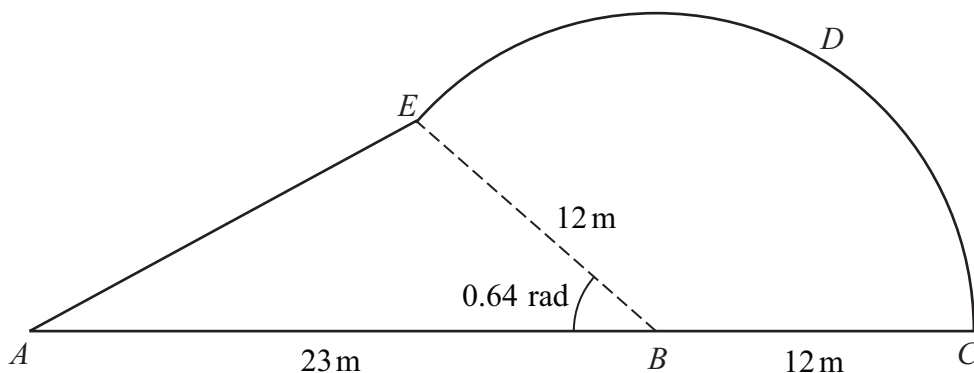


Figure 2

Figure 2 shows a plan view of a garden.
The plan of the garden *ABCDEA* consists of a triangle *ABE* joined to a sector *BCDE* of a circle with radius 12m and centre *B*.
The points *A*, *B* and *C* lie on a straight line with $AB = 23\text{ m}$ and $BC = 12\text{ m}$.

Given that the size of angle *ABE* is exactly 0.64 radians, find

(a) the area of the garden, giving your answer in m^2 , to 1 decimal place, (4)

(b) the perimeter of the garden, giving your answer in metres, to 1 decimal place. (5)

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7. (i) Find the exact value of x for which

$$\log_2(2x) = \log_2(5x + 4) - 3 \quad (4)$$

(ii) Given that

$$\log_a y + 3\log_a 2 = 5$$

express y in terms of a .
Give your answer in its simplest form.

(3)



8. (i) Solve, for $-180^\circ \leq x < 180^\circ$,

$$\tan(x - 40^\circ) = 1.5$$

giving your answers to 1 decimal place.

(3)

- (ii) (a) Show that the equation

$$\sin\theta \tan\theta = 3\cos\theta + 2$$

can be written in the form

$$4\cos^2\theta + 2\cos\theta - 1 = 0$$

(3)

- (b) Hence solve, for $0 \leq \theta < 360^\circ$,

$$\sin\theta \tan\theta = 3\cos\theta + 2$$

showing each stage of your working.

(5)



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9. The curve with equation

$$y = x^2 - 32\sqrt{x} + 20, \quad x > 0$$

has a stationary point P .

Use calculus

(a) to find the coordinates of P ,

(6)

(b) to determine the nature of the stationary point P .

(3)



10.

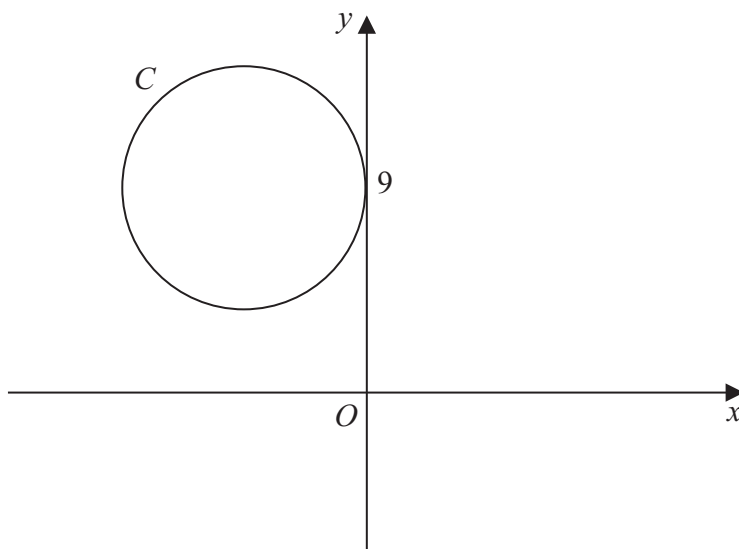


Figure 4

The circle C has radius 5 and touches the y -axis at the point $(0, 9)$, as shown in Figure 4.

(a) Write down an equation for the circle C , that is shown in Figure 4. (3)

A line through the point $P(8, -7)$ is a tangent to the circle C at the point T .

(b) Find the length of PT . (3)



Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						6	6	6	4	/	0	1	Signature	

Paper Reference(s)

6664/01

Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Friday 13 January 2012 – Morning
Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
1	
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6	
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9	
Total	

<u>Materials required for examination</u>	<u>Items included with question papers</u>
Mathematical Formulae (Pink)	Nil

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 or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper. Answer ALL the questions. You must write your answer for each question in the space following the question. When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided. Full marks may be obtained for answers to ALL questions. The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 9 questions in this question paper. The total mark for this paper is 75. There are 28 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled. You should show sufficient working to make your methods clear to the Examiner. Answers without working may not gain full credit.



Turn over

3. (a) Find the first 4 terms of the binomial expansion, in ascending powers of x , of

$$\left(1 + \frac{x}{4}\right)^8$$

giving each term in its simplest form.

(4)

(b) Use your expansion to estimate the value of $(1.025)^8$, giving your answer to 4 decimal places.

(3)



6.

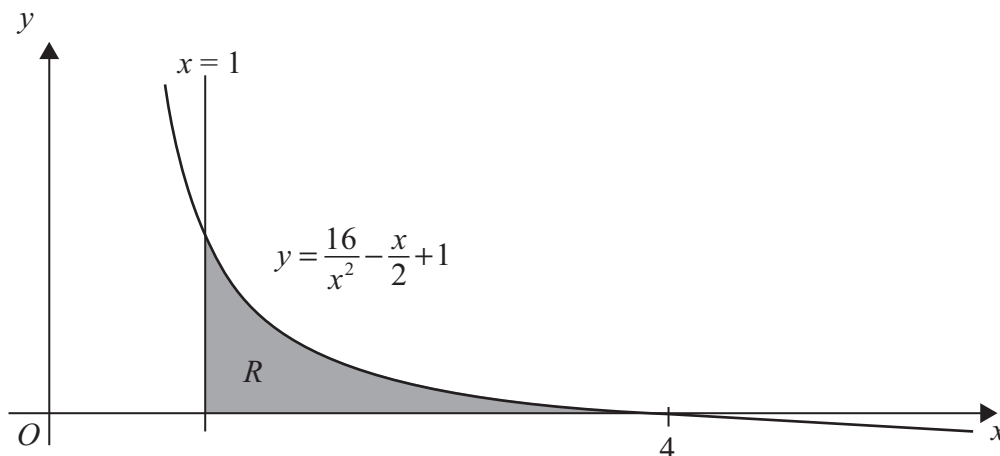


Figure 1

Figure 1 shows the graph of the curve with equation

$$y = \frac{16}{x^2} - \frac{x}{2} + 1, \quad x > 0$$

The finite region R , bounded by the lines $x = 1$, the x -axis and the curve, is shown shaded in Figure 1. The curve crosses the x -axis at the point $(4, 0)$.

(a) Complete the table with the values of y corresponding to $x = 2$ and 2.5

x	1	1.5	2	2.5	3	3.5	4
y	16.5	7.361			1.278	0.556	0

(2)

(b) Use the trapezium rule with all the values in the completed table to find an approximate value for the area of R , giving your answer to 2 decimal places.

(4)

(c) Use integration to find the exact value for the area of R .

(5)



7.

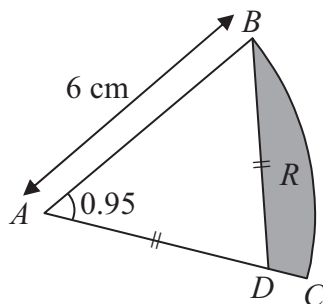


Figure 2

Figure 2 shows ABC , a sector of a circle of radius 6 cm with centre A . Given that the size of angle BAC is 0.95 radians, find

(a) the length of the arc BC , (2)

(b) the area of the sector ABC . (2)

The point D lies on the line AC and is such that $AD = BD$. The region R , shown shaded in Figure 2, is bounded by the lines CD , DB and the arc BC .

(c) Show that the length of AD is 5.16 cm to 3 significant figures. (2)

Find

(d) the perimeter of R , (2)

(e) the area of R , giving your answer to 2 significant figures. (4)



8.

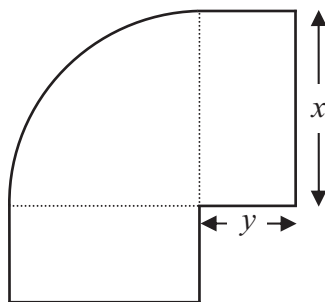


Figure 3

Figure 3 shows a flowerbed. Its shape is a quarter of a circle of radius x metres with two equal rectangles attached to it along its radii. Each rectangle has length equal to x metres and width equal to y metres.

Given that the area of the flowerbed is 4 m^2 ,

(a) show that

$$y = \frac{16 - \pi x^2}{8x} \tag{3}$$

(b) Hence show that the perimeter P metres of the flowerbed is given by the equation

$$P = \frac{8}{x} + 2x \tag{3}$$

(c) Use calculus to find the minimum value of P . (5)

(d) Find the width of each rectangle when the perimeter is a minimum. Give your answer to the nearest centimetre. (2)



9. (i) Find the solutions of the equation $\sin(3x - 15^\circ) = \frac{1}{2}$, for which $0 \leq x \leq 180^\circ$

(6)

(ii)

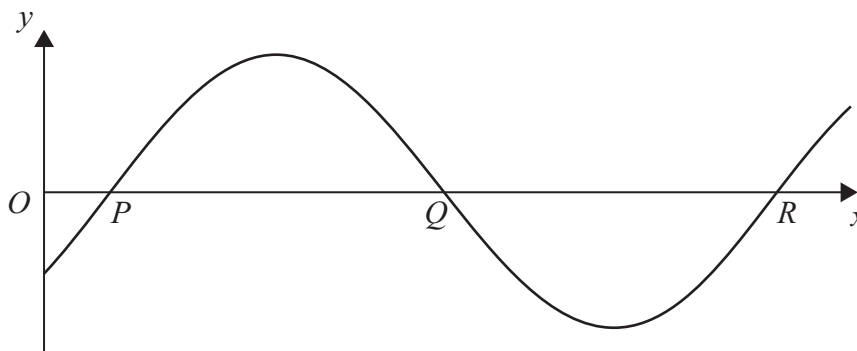


Figure 4

Figure 4 shows part of the curve with equation

$$y = \sin(ax - b), \text{ where } a > 0, 0 < b < \pi$$

The curve cuts the x -axis at the points P , Q and R as shown.

Given that the coordinates of P , Q and R are $(\frac{\pi}{10}, 0)$, $(\frac{3\pi}{5}, 0)$ and $(\frac{11\pi}{10}, 0)$ respectively, find the values of a and b .

(4)



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Surname	Other names
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Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Core Mathematics C2

Advanced Subsidiary

Monday 13 January 2014 – Morning
Time: 1 hour 30 minutes

Paper Reference
6664A/01

You must have:
 Mathematical Formulae and Statistical Tables (Pink)

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 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.

Turn over ►

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Question 1 continued

Lined writing area consisting of multiple horizontal lines for providing answers.

(Total 5 marks)

Q1



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4. The first term of a geometric series is 5 and the common ratio is 1.2

For this series find, to 1 decimal place,

(a) (i) the 20th term,

(ii) the sum of the first 20 terms.

(4)

The sum of the first n terms of the series is greater than 3000

(b) Calculate the smallest possible value of n .

(4)



5. The height of water, H metres, in a harbour on a particular day is given by the equation

$$H = 10 + 5 \sin \left(\frac{\pi t}{6} \right), \quad 0 \leq t < 24$$

where t is the number of hours after midnight.

(a) Show that the height of the water 1 hour after midnight is 12.5 metres. **(1)**

(b) Find, to the nearest minute, the times before midday when the height of the water is 9 metres. **(6)**



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Question 5 continued

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Q5

(Total 7 marks)



7.

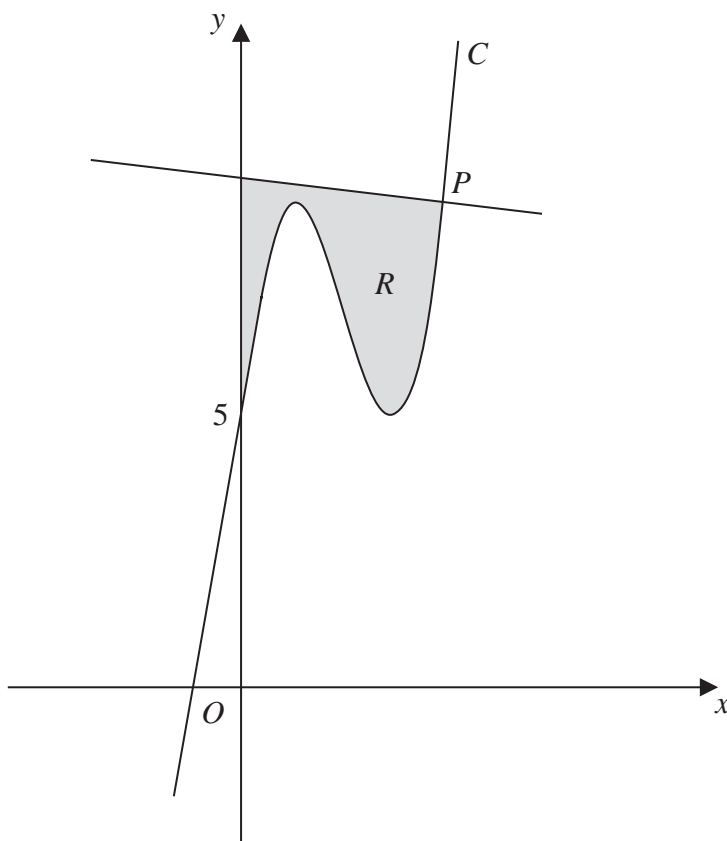


Figure 1

Figure 1 shows a sketch of part of the curve C with equation

$$y = x^3 - 6x^2 + 9x + 5$$

The point $P(4, 9)$ lies on C .

(a) Show that the normal to C at the point P has equation

$$x + 9y = 85 \tag{6}$$

The region R , shown shaded in Figure 1, is bounded by the curve C , the y -axis and the normal to C at P .

(b) Showing all your working, calculate the exact area of R . (7)



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Question 7 continued

Lined area for writing answers to Question 7.

(Total 13 marks)

Q7



8.

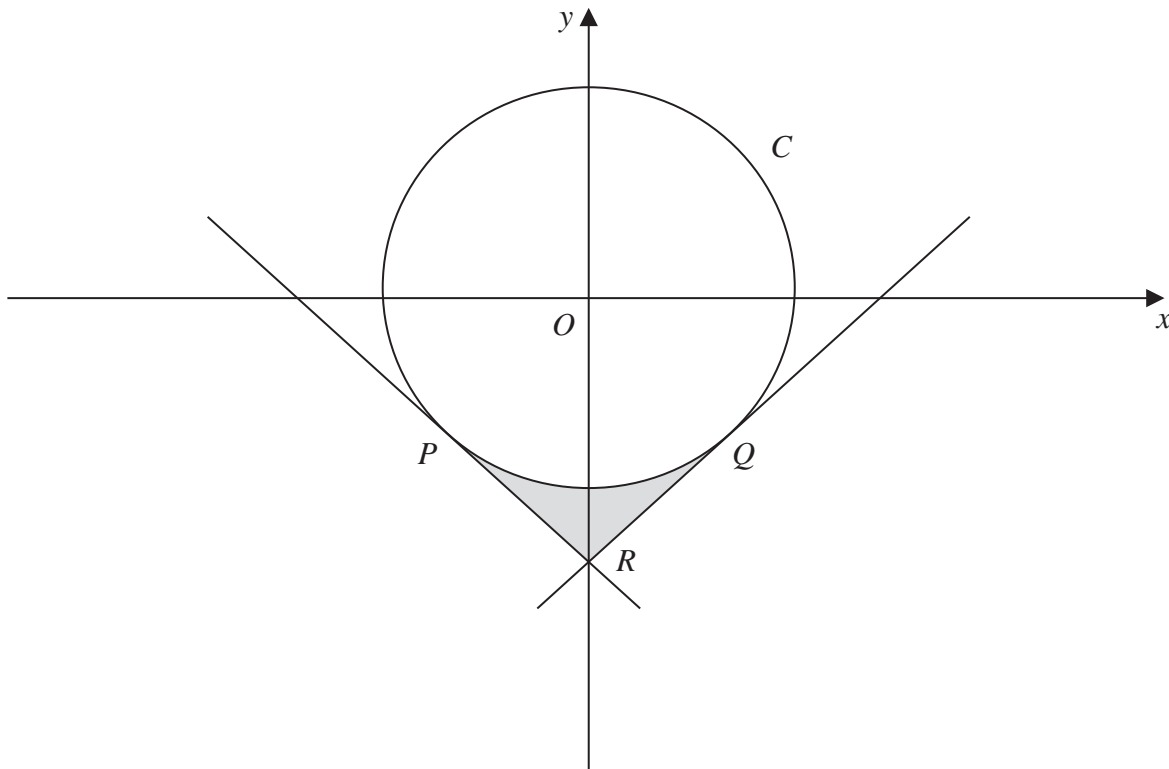


Figure 2

Figure 2 shows a circle C with centre O and radius 5

(a) Write down the cartesian equation of C . (1)

The points $P(-3, -4)$ and $Q(3, -4)$ lie on C .

(b) Show that the tangent to C at the point Q has equation $3x - 4y = 25$ (4)

(c) Show that, to 3 decimal places, angle POQ is 1.287 radians. (2)

The tangent to C at P and the tangent to C at Q intersect on the y -axis at the point R .

(d) Find the area of the shaded region PQR shown in Figure 2. (4)



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Question 8 continued

Lined area for writing the answer to Question 8.



3.

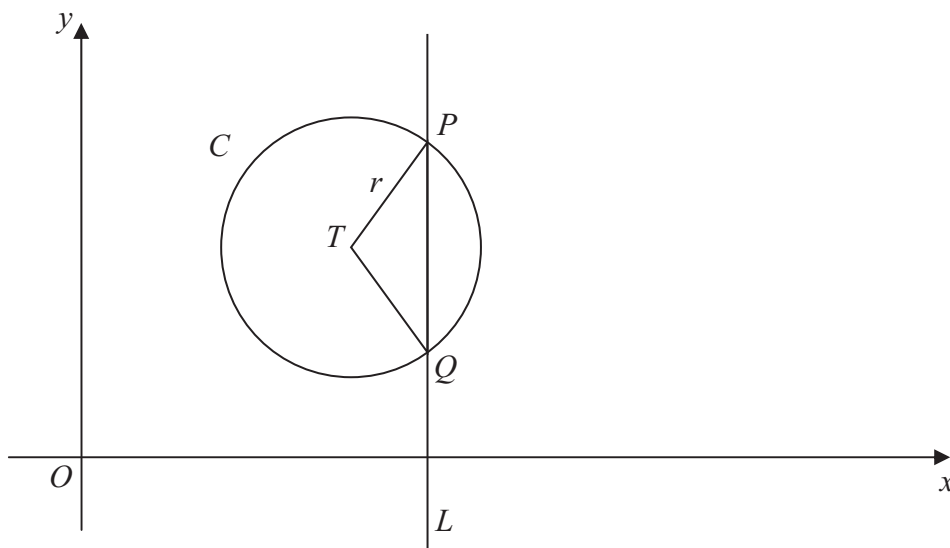


Figure 1

The circle C with centre T and radius r has equation

$$x^2 + y^2 - 20x - 16y + 139 = 0$$

(a) Find the coordinates of the centre of C .

(3)

(b) Show that $r = 5$

(2)

The line L has equation $x = 13$ and crosses C at the points P and Q as shown in Figure 1.

(c) Find the y coordinate of P and the y coordinate of Q .

(3)

Given that, to 3 decimal places, the angle PTQ is 1.855 radians,

(d) find the perimeter of the sector PTQ .

(3)



4. $f(x) = 2x^3 - 7x^2 - 10x + 24$

(a) Use the factor theorem to show that $(x + 2)$ is a factor of $f(x)$. **(2)**

(b) Factorise $f(x)$ completely. **(4)**



5.

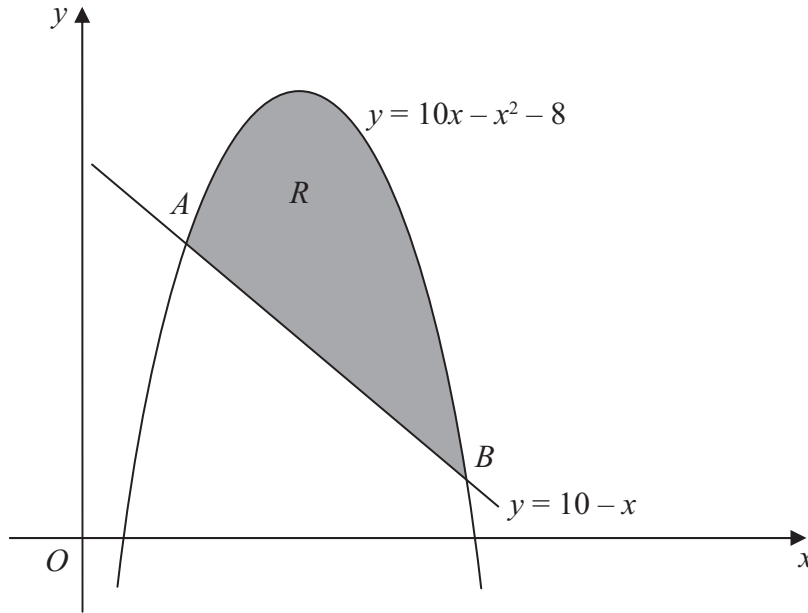


Figure 2

Figure 2 shows the line with equation $y = 10 - x$ and the curve with equation $y = 10x - x^2 - 8$

The line and the curve intersect at the points A and B , and O is the origin.

(a) Calculate the coordinates of A and the coordinates of B . (5)

The shaded area R is bounded by the line and the curve, as shown in Figure 2.

(b) Calculate the exact area of R . (7)

6. (a) Show that the equation

$$\tan 2x = 5 \sin 2x$$

can be written in the form

$$(1 - 5 \cos 2x) \sin 2x = 0 \tag{2}$$

(b) Hence solve, for $0 \leq x \leq 180^\circ$,

$$\tan 2x = 5 \sin 2x$$

giving your answers to 1 decimal place where appropriate.
You must show clearly how you obtained your answers.

(5)



8.

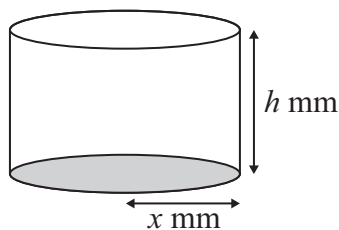


Figure 3

A manufacturer produces pain relieving tablets. Each tablet is in the shape of a solid circular cylinder with base radius x mm and height h mm, as shown in Figure 3.

Given that the volume of each tablet has to be 60 mm^3 ,

(a) express h in terms of x , (1)

(b) show that the surface area, $A \text{ mm}^2$, of a tablet is given by $A = 2\pi x^2 + \frac{120}{x}$ (3)

The manufacturer needs to minimise the surface area $A \text{ mm}^2$, of a tablet.

(c) Use calculus to find the value of x for which A is a minimum. (5)

(d) Calculate the minimum value of A , giving your answer to the nearest integer. (2)

(e) Show that this value of A is a minimum. (2)



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Question 9 continued

Lined area for writing the answer to Question 9 continued.

Q9

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(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

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