Write your name here

Surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | Candidate Number

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.

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P 4 3 9 9 8 A 0 1 2 8

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1. The first three terms in ascending powers of x in the binomial expansion of $(1 + px)^{12}$ are given by

$$1 + 18x + qx^2$$

where p and q are constants.

Find the value of p and the value of q.

(5)

P 4 3 9 9 8 A 0 2 2 8

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Question 1 continued

Q1

(Total 5 marks)

P 4 3 9 9 8 A 0 3 2 8

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2. $$f(x) = 2x^3 + x^2 + ax + b, \quad \text{where } a \text{ and } b \text{ are constants.}$$

Given that when $f(x)$ is divided by $(x - 2)$ the remainder is 25,

(a) show that $2a + b = 5$

(2)

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

(b) find the value of a and the value of b.

(4)

P 4 3 9 9 8 A 0 4 2 8

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Question 2 continued

Q2

(Total 6 marks)

P 4 3 9 9 8 A 0 5 2 8

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3. The curve C has equation

$$y = 2\sqrt{x} + \frac{18}{\sqrt{x}} - 1, \qquad x > 0$$

(a) Find

(i) $\dfrac{dy}{dx}$

(ii) $\dfrac{d^2y}{dx^2}$

(5)

(b) Use calculus to find the coordinates of the stationary point of C.

(4)

(c) Determine whether the stationary point is a maximum or minimum, giving a reason for your answer.

(2)

P 4 3 9 9 8 A 0 6 2 8

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Question 3 continued

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Question 3 continued

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Question 3 continued

Q3

(Total 11 marks)

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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)

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Question 4 continued

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Question 4 continued

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Question 4 continued

Q4

(Total 8 marks)

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

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

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)

P 4 3 9 9 8 A 0 1 4 2 8

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Question 5 continued

Q5

(Total 7 marks)

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6. Given that

$$\log_x(7y + 1) - \log_x(2y) = 1, \qquad x > 4, \qquad 0 < y < 1$$

express y in terms of x.

(5)

P 4 3 9 9 8 A 0 1 6 2 8

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Question 6 continued

Q6

(Total 5 marks)

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7.

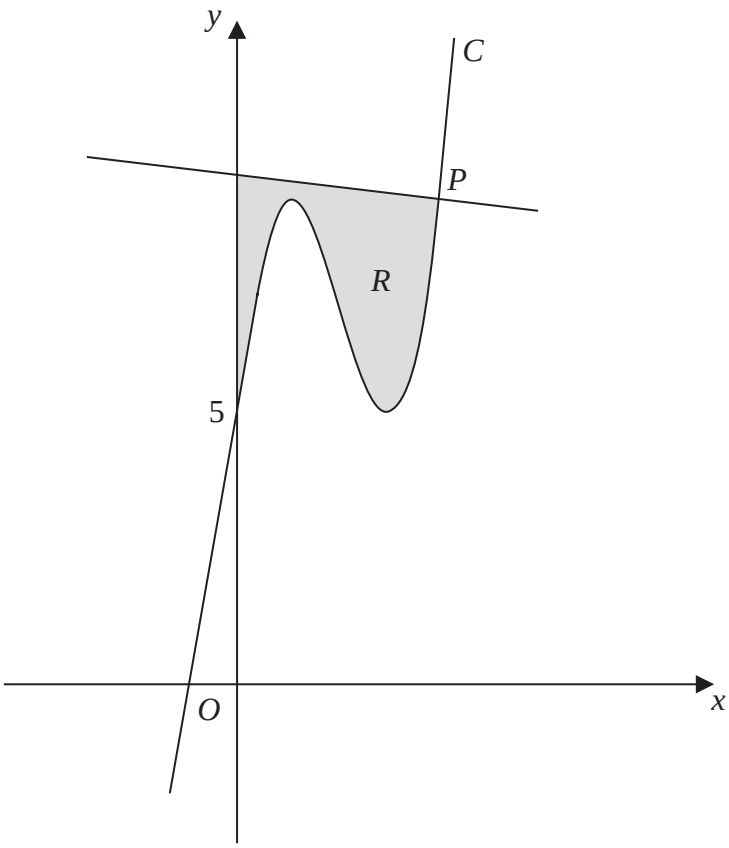

Figure 1

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

$$x + 9y = 85$$

(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

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Question 7 continued

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Question 7 continued

(Total 13 marks)

Q7

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8.

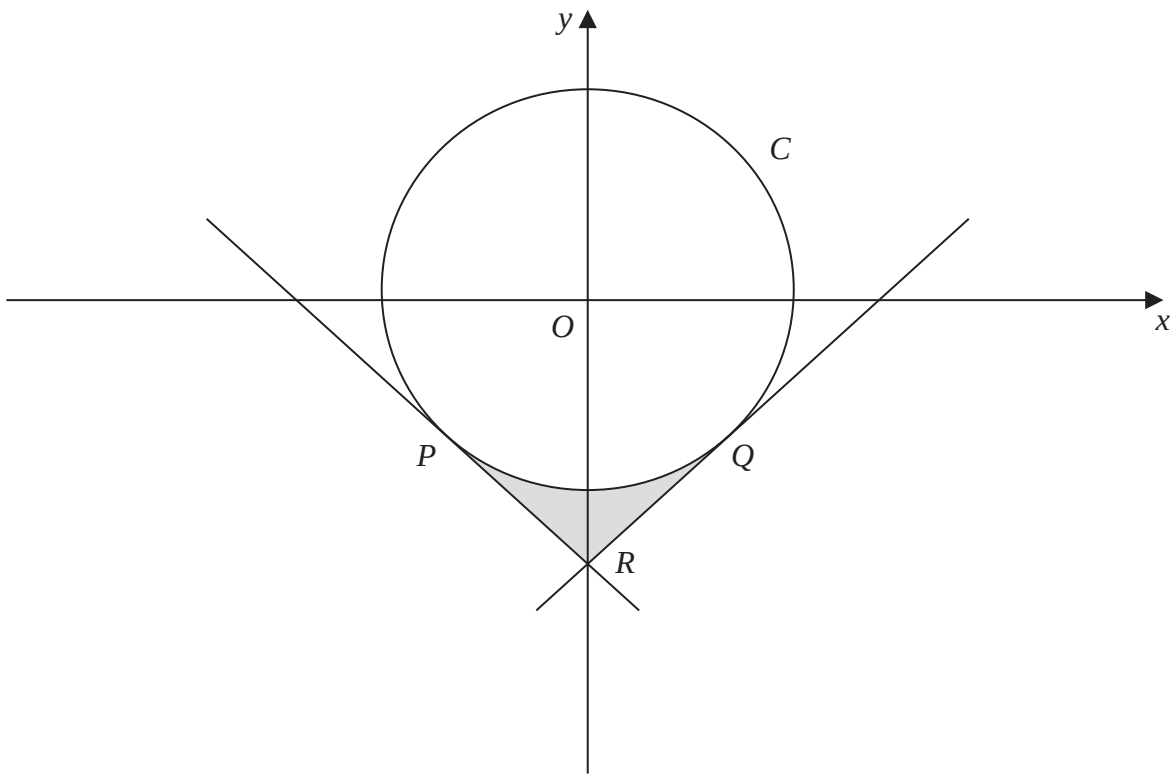

Figure 2

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)

P 4 3 9 9 8 A 0 2 2 2 8

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Question 8 continued

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Question 8 continued

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Question 8 continued

Q8

(Total 11 marks)

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9. (a) Show that the equation

$$5 \sin x - \cos^2 x + 2 \sin^2 x = 1$$

can be written in the form

$$3 \sin^2 x + 5 \sin x - 2 = 0$$

(2)

(b) Hence solve, for $-180° \leqslant \theta < 180°$, the equation

$$5 \sin 2\theta - \cos^2 2\theta + 2 \sin^2 2\theta = 1$$

giving your answers to 2 decimal places.

(7)

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Question 9 continued

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Question 9 continued

Q9

(Total 9 marks)

TOTAL FOR PAPER: 75 MARKS

END

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