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Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number | Candidate Number

Core Mathematics C1

Advanced Subsidiary

Wednesday 18 May 2016 – Morning

Time: 1 hour 30 minutes

Paper Reference **6663/01**

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

Total Marks

Calculators may NOT be used in this examination.

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.

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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1. Find

$$\int \left(2x^4 - \frac{4}{\sqrt{x}} + 3 \right) \mathrm{d}x$$

giving each term in its simplest form.

(4)

Q1

(Total 4 marks)

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2. Express 9^{3x+1} in the form 3^y, giving y in the form $ax + b$, where a and b are constants.

(2)

(Total 2 marks)

Q2

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3. (a) Simplify

$$\sqrt{50} - \sqrt{18}$$

giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2)

(b) Hence, or otherwise, simplify

$$\frac{12\sqrt{3}}{\sqrt{50} - \sqrt{18}}$$

giving your answer in the form $b\sqrt{c}$, where b and c are integers and $b \neq 1$

(3)

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Question 3 continued

Q3

(Total 5 marks)

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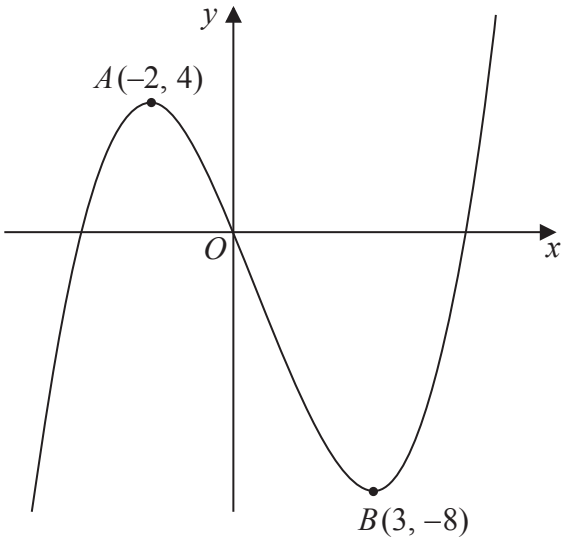

Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = \mathrm{f}(x)$. The curve has a maximum point A at $(-2, 4)$ and a minimum point B at $(3, -8)$ and passes through the origin O.

On separate diagrams, sketch the curve with equation

(a) $y = 3\mathrm{f}(x)$,

(2)

(b) $y = \mathrm{f}(x) - 4$

(3)

On each diagram, show clearly the coordinates of the maximum and the minimum points and the coordinates of the point where the curve crosses the y-axis.

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Question 4 continued

Q4

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5. Solve the simultaneous equations

$$y + 4x + 1 = 0$$

$$y^2 + 5x^2 + 2x = 0$$

(6)

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Question 5 continued

Q5

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6. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 4,$$

$$a_{n+1} = 5 - ka_n, \quad n \geqslant 1$$

where k is a constant.

(a) Write down expressions for a_2 and a_3 in terms of k.

(2)

Find

(b) $\sum_{r=1}^{3}(1 + a_r)$ in terms of k, giving your answer in its simplest form,

(3)

(c) $\sum_{r=1}^{100}(a_{r+1} + ka_r)$

(1)

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Question 6 continued

Q6

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7. Given that

$$y = 3x^2 + 6x^{\frac{1}{3}} + \frac{2x^3 - 7}{3\sqrt{x}}, \quad x > 0$$

find $\frac{dy}{dx}$. Give each term in your answer in its simplified form.

(6)

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Question 7 continued

Q7

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8. The straight line with equation $y = 3x - 7$ does not cross or touch the curve with equation $y = 2px^2 - 6px + 4p$, where p is a constant.

(a) Show that $4p^2 - 20p + 9 < 0$

(4)

(b) Hence find the set of possible values of p.

(4)

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Question 8 continued

Q8

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9. On John's 10th birthday he received the first of an annual birthday gift of money from his uncle. This first gift was £60 and on each subsequent birthday the gift was £15 more than the year before. The amounts of these gifts form an arithmetic sequence.

(a) Show that, immediately after his 12th birthday, the total of these gifts was £225 **(1)**

(b) Find the amount that John received from his uncle as a birthday gift on his 18th birthday. **(2)**

(c) Find the total of these birthday gifts that John had received from his uncle up to and including his 21st birthday. **(3)**

When John had received n of these birthday gifts, the total money that he had received from these gifts was £3375

(d) Show that $n^2 + 7n = 25 \times 18$ **(3)**

(e) Find the value of n, when he had received £3375 in total, and so determine John's age at this time. **(2)**

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Question 9 continued

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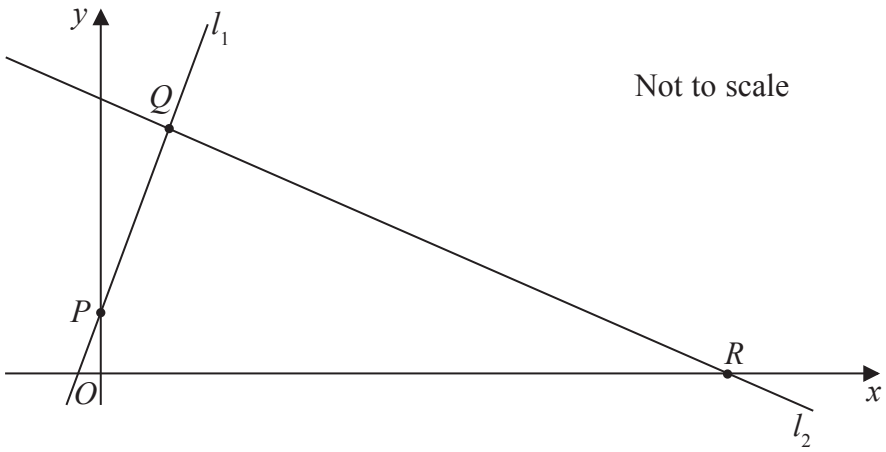

Figure 2

The points P (0, 2) and Q (3, 7) lie on the line l_1, as shown in Figure 2.

The line l_2 is perpendicular to l_1, passes through Q and crosses the x-axis at the point R, as shown in Figure 2.

Find

(a) an equation for l_2, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers,

(5)

(b) the exact coordinates of R,

(2)

(c) the exact area of the quadrilateral $ORQP$, where O is the origin.

(5)

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Question 10 continued

Q10

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11. The curve C has equation $y = 2x^3 + kx^2 + 5x + 6$, where k is a constant.

(a) Find $\frac{dy}{dx}$

(2)

The point P, where $x = -2$, lies on C.

The tangent to C at the point P is parallel to the line with equation $2y - 17x - 1 = 0$

Find

(b) the value of k,

(4)

(c) the value of the y coordinate of P,

(2)

(d) the equation of the tangent to C at P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(2)

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Q11

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TOTAL FOR PAPER: 75 MARKS

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