OCR
Oxford Cambridge and RSA

Wednesday 16 May 2018 – Morning

AS GCE MATHEMATICS

4721/01 Core Mathematics 1

QUESTION PAPER

7302419737

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4721/01
- List of Formulae (MF1)

Other materials required:
None

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.
- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book.** If additional space is required, you should use the lined page(s) at the end of the Printed Answer Book. The question number(s) must be clearly shown.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Do **not** write in the barcodes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.
- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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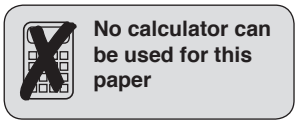

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Answer **all** the questions.

1 Solve the equation $(2+\sqrt{5})x = 6-\sqrt{5}$, giving x in the form $a+b\sqrt{5}$ where a and b are integers. **[4]**

2 The velocity of an object, $v\,\text{m}\,\text{s}^{-1}$, at a time t seconds is given by

$$v = 20t - 4t^2, \qquad 0 \leqslant t \leqslant 5.$$

(i) Find the rate of change of the velocity of the object with respect to time when $t = 3$. **[3]**

(ii) Hence state, with a reason, whether the velocity of the object is increasing or decreasing when $t = 3$. **[1]**

3 Find the equation of the straight line that passes through the points (–1, 6) and (3, 4), giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **[5]**

4 Find the real values of x which satisfy the equation $3x^4 - 7x^2 - 20 = 0$. **[5]**

5 It is given that $\text{f}(x) = 2x^{\frac{3}{2}} - 2x^2 + 10x$.

(i) Find f'(x) and f''(x). **[4]**

(ii) Evaluate f'(4) and f''(4). Explain what your answers tell you about the graph of y = f(x) at the point where $x = 4$. **[2]**

6 **(i)** Sketch the curve $y = \dfrac{3}{x}$. **[2]**

(ii) The curve $y = \dfrac{3}{x}$ is translated by four units in the positive x direction. State the equation of the curve after it has been translated. **[2]**

(iii) Describe fully a transformation that transforms the curve $y = \dfrac{3}{x}$ to $y = \dfrac{2}{x}$. **[2]**

7 **(i)** Express $–2x^2 – 16x – 9$ in the form $a(x + b)^2 + c$, where a, b and c are integers. **[4]**

(ii) Write down the maximum value of $–2x^2 – 16x – 9$. **[1]**

(iii) State the equation of the line of symmetry of the curve $y = –2x^2 – 16x – 9$. **[1]**

8 The line $y + 2x = 1$ meets the circle $x^2 + y^2 = 13$ at the points A and B. Find the coordinates of the midpoint of AB. **[7]**

9 The equation $kx^2 - 4x + 3k - 1 = 0$ has no real roots.

(i) Show that $3k^2 - k - 4 > 0$. **[3]**

(ii) Determine the possible values of k. **[4]**

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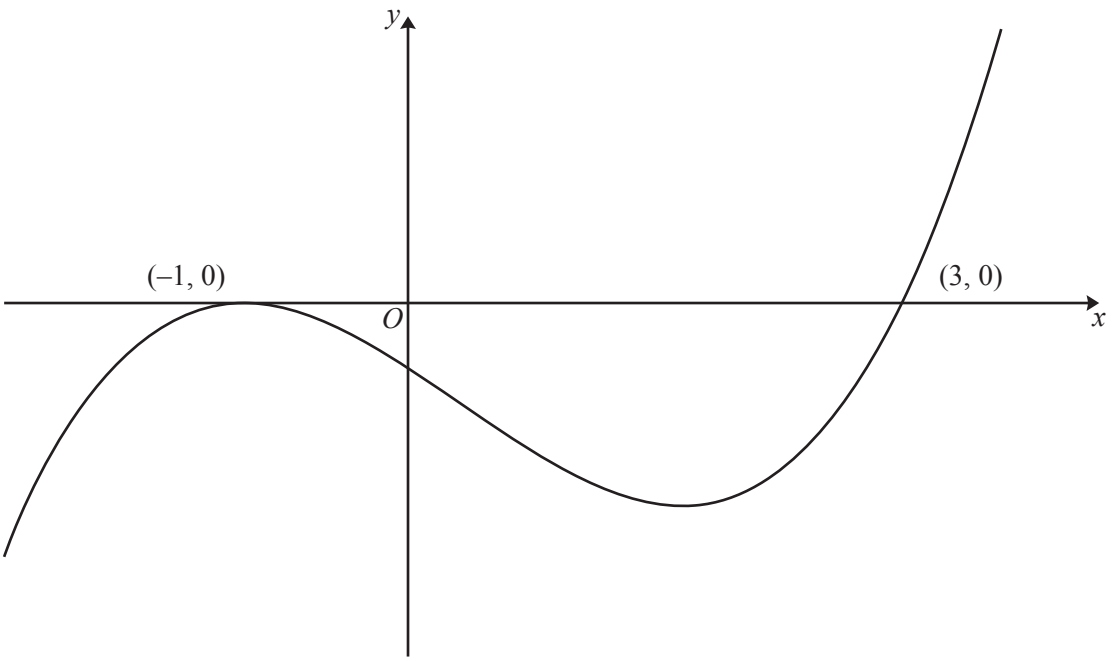

The diagram shows part of the curve $y = x^3 + px^2 + qx + r$. The curve passes through the point (3, 0) and there is a maximum point at (–1, 0). Find the values of p, q and r and hence determine the coordinates of the minimum point of the curve. **[9]**

11 A circle has centre C (6, – 3) and radius $\sqrt{10}$.

(i) Find the equation of the circle, giving your answer in the form $x^2 + y^2 + ax + by + c = 0$. **[3]**

(ii) Find an equation of the tangent to the circle at the point with coordinates (3, –2). **[5]**

The point Q has coordinates (10, 1).

(iii) Find the length of QC, giving your answer in simplified surd form. **[2]**

(iv) A tangent from Q to the circle meets the circle at T. Find the length of QT. **[3]**

END OF QUESTION PAPER

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