OCR
Oxford Cambridge and RSA

Wednesday 13 May 2015 – Morning

AS GCE MATHEMATICS

4721/01 Core Mathematics 1

QUESTION PAPER

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

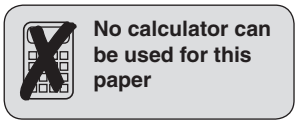
These instructions are the same on the Printed Answer Book and the Question Paper.
- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- 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 bar codes.
- 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

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.



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1 Express $\frac{8}{\sqrt{3}-1}$ in the form $a\sqrt{3}+b$, where a and b are integers. **[3]**

2 **(i)** Sketch the curve $y=-\frac{1}{x}$. **[2]**

(ii) The curve $y=-\frac{1}{x}$ is translated by 2 units parallel to the x-axis in the positive direction. State the equation of the transformed curve. **[2]**

(iii) Describe a transformation that transforms the curve $y=-\frac{1}{x}$ to the curve $y=-\frac{1}{3x}$. **[2]**

3 Express each of the following in the form 5^k.

(i) 25^4 **[1]**

(ii) $\frac{1}{\sqrt[4]{5}}$ **[2]**

(iii) $(5\sqrt{5})^3$ **[2]**

4 Solve the equation $x^{\frac{2}{3}}-x^{\frac{1}{3}}-6=0$. **[5]**

5 The points A and B have coordinates (2, 1) and (5, –3) respectively.

(i) Find the length of AB. **[2]**

(ii) Find an equation of the line through the mid-point of AB which is perpendicular to AB, giving your answer in the form $ax+by+c=0$ where a, b and c are integers. **[7]**

6 Solve the simultaneous equations

$$2x+y-5=0, \qquad x^2-y^2=3. \quad \textbf{[5]}$$

7 **(a)** Given that $\mathrm{f}(x)=(x^2+3)(5-x)$, find $\mathrm{f}'(x)$. **[4]**

(b) Find the gradient of the curve $y=x^{-\frac{1}{3}}$ at the point where $x=-8$. **[4]**

8 **(i)** Sketch the curve $y = 2x^2 - x - 3$, giving the coordinates of all points of intersection with the axes. **[4]**

(ii) Hence, or otherwise, solve the inequality $2x^2 - x - 3 > 0$. **[2]**

(iii) Given that the equation $2x^2 - x - 3 = k$ has no real roots, find the set of possible values of the constant k. **[3]**

9 The curve $y = 2x^3 - ax^2 + 8x + 2$ passes through the point B where $x = 4$.

(i) Given that B is a stationary point of the curve, find the value of the constant a. **[5]**

(ii) Determine whether the stationary point B is a maximum point or a minimum point. **[2]**

(iii) Find the x-coordinate of the other stationary point of the curve. **[3]**

10 A circle with centre C has equation $x^2 + y^2 - 10x + 4y + 4 = 0$.

(i) Find the coordinates of C and the radius of the circle. **[3]**

(ii) Show that the tangent to the circle at the point P (8, 2) has equation $3x + 4y = 32$. **[5]**

(iii) The circle meets the y-axis at Q and the tangent meets the y-axis at R. Find the area of triangle PQR. **[4]**

END OF QUESTION PAPER