OCR
Oxford Cambridge and RSA

Wednesday 18 May 2016 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

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.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

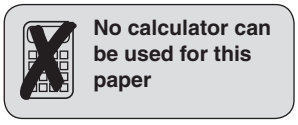
INFORMATION FOR CANDIDATES

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 advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- 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.



Section A (36 marks)

1 Find the value of each of the following.

(i) 3^0 **[1]**

(ii) $9^{\frac{3}{2}}$ **[2]**

(iii) $\left(\frac{4}{5}\right)^{-2}$ **[2]**

2 Find the coordinates of the point of intersection of the lines $2x + 3y = 12$ and $y = 7 - 3x$. **[4]**

3 **(i)** Solve the inequality $\frac{1-2x}{4} > 3$. **[2]**

(ii) Simplify $(5c^2d)^3 \times \frac{2c^4}{d^5}$. **[2]**

4 You are given that $a = \frac{3c+2a}{2c-5}$. Express a in terms of c. **[4]**

5 **(i)** Express $\sqrt{50} + 3\sqrt{8}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. **[2]**

(ii) Express $\frac{5+2\sqrt{3}}{4-\sqrt{3}}$ in the form $c + d\sqrt{3}$, where c and d are integers. **[3]**

6 Find the binomial expansion of $(1 - 5x)^4$, expressing the terms as simply as possible. **[4]**

7 **(i)** Solve the equation $(x - 2)^2 = 9$. **[2]**

(ii) Sketch the curve $y = (x - 2)^2 - 9$, showing the coordinates of its intersections with the axes and its turning point. **[3]**

8 You are given that $f(x) = x^3 + ax + c$ and that $f(2) = 11$. The remainder when $f(x)$ is divided by $(x + 1)$ is 8. Find the values of a and c. **[5]**

Section B (36 marks)

9 Fig. 9 shows the curves $y = \frac{1}{x+2}$ and $y = x^2 + 7x + 7$.

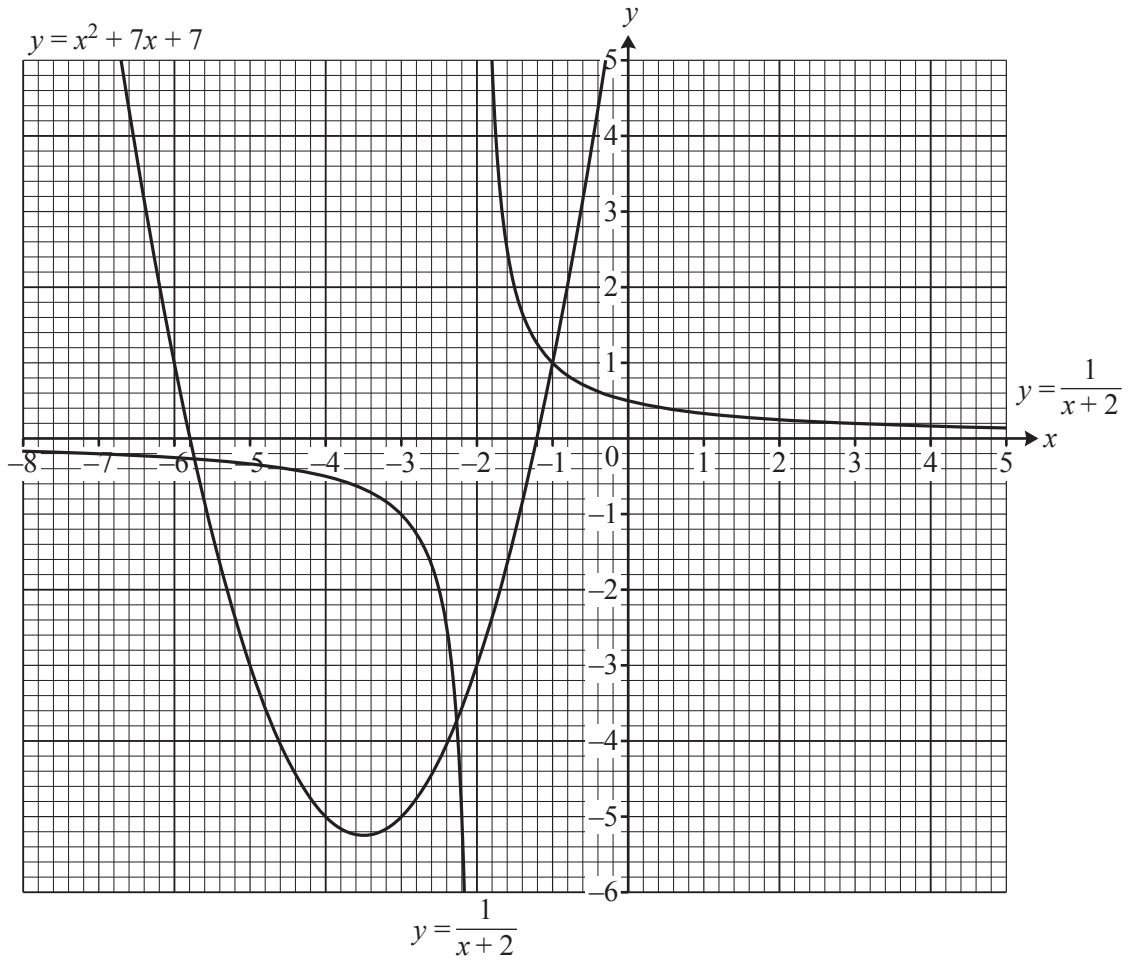


Fig. 9

(i) Use Fig. 9 to estimate graphically the roots of the equation $\frac{1}{x+2} = x^2 + 7x + 7$. **[2]**

(ii) Show that the equation in part **(i)** may be simplified to $x^3 + 9x^2 + 21x + 13 = 0$. Find algebraically the exact roots of this equation. **[7]**

(iii) The curve $y = x^2 + 7x + 7$ is translated by $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$.

(*A*) Show graphically that the translated curve intersects the curve $y = \frac{1}{x+2}$ at only one point. Estimate the coordinates of this point. **[2]**

(*B*) Find the equation of the translated curve, simplifying your answer. **[2]**

10 Fig. 10 shows a sketch of the points A (2, 7), B (0, 3) and C (8, −1).

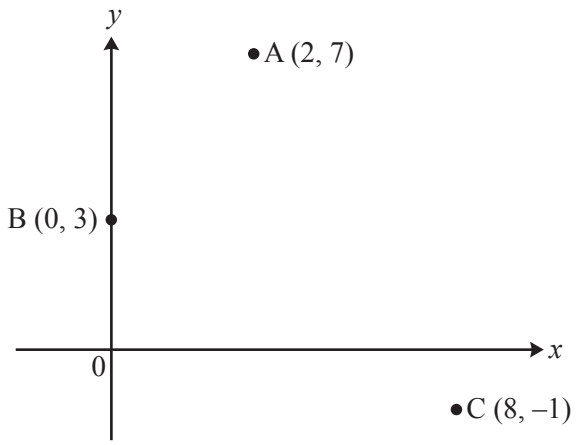


Fig. 10

(i) Prove that angle ABC is 90°. **[3]**

(ii) Find the equation of the circle which has AC as a diameter. **[4]**

(iii) Find the equation of the tangent to this circle at A. Give your answer in the form $ay = bx + c$, where a, b and c are integers. **[4]**

11 **(i)** Find the coordinates of the points of intersection of the curve $y = 2x^2 - 5x - 3$ with the axes. **[3]**

(ii) Find the coordinates of the points of intersection of the curve $y = 2x^2 - 5x - 3$ and the line $y = x + 3$. **[4]**

(iii) Find the set of values of k for which the line $y = x + k$ does not intersect the curve $y = 2x^2 - 5x - 3$. **[5]**

END OF QUESTION PAPER