OCR
RECOGNISING ACHIEVEMENT

Monday 13 May 2013 – Afternoon

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 in the centre of 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.

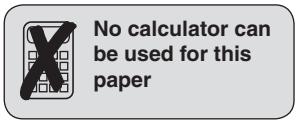
INFORMATION FOR CANDIDATES

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.



DC (NH/JG) 65475/2

Section A (36 marks)

1 Find the equation of the line which is perpendicular to the line $y = 2x - 5$ and which passes through the point $(4, 1)$. Give your answer in the form $y = ax + b$. **[3]**

2 Find the coordinates of the point of intersection of the lines $y = 3x - 2$ and $x + 3y = 1$. **[4]**

3 **(i)** Evaluate $(0.2)^{-2}$. **[2]**

(ii) Simplify $(16a^{12})^{\frac{3}{4}}$. **[3]**

4 Rearrange the following formula to make r the subject, where $r > 0$.

$$V = \frac{1}{3}\pi r^2(a + b)$$ **[3]**

5 You are given that $f(x) = x^5 + kx - 20$. When $f(x)$ is divided by $(x - 2)$, the remainder is 18. Find the value of k. **[3]**

6 Find the coefficient of x^3 in the binomial expansion of $(2 - 4x)^5$. **[4]**

7 **(i)** Express $125\sqrt{5}$ in the form 5^k. **[2]**

(ii) Simplify $10 + 7\sqrt{5} + \dfrac{38}{1 - 2\sqrt{5}}$, giving your answer in the form $a + b\sqrt{5}$. **[3]**

8 Express $3x^2 - 12x + 5$ in the form $a(x - b)^2 - c$. Hence state the minimum value of y on the curve $y = 3x^2 - 12x + 5$. **[5]**

9 $n - 1$, n and $n + 1$ are any three consecutive integers.

(i) Show that the sum of these integers is always divisible by 3. **[1]**

(ii) Find the sum of the squares of these three consecutive integers and explain how this shows that the sum of the squares of any three consecutive integers is never divisible by 3. **[3]**

Section B (36 marks)

10 The circle $(x-3)^2+(y-2)^2=20$ has centre C.

(i) Write down the radius of the circle and the coordinates of C. **[2]**

(ii) Find the coordinates of the intersections of the circle with the x- and y-axes. **[5]**

(iii) Show that the points $A(1,6)$ and $B(7,4)$ lie on the circle. Find the coordinates of the midpoint of AB. Find also the distance of the chord AB from the centre of the circle. **[5]**

11 You are given that $f(x)=(2x-3)(x+2)(x+4)$.

(i) Sketch the graph of $y=f(x)$. **[3]**

(ii) State the roots of $f(x-2)=0$. **[2]**

(iii) You are also given that $g(x)=f(x)+15$.

(*A*) Show that $g(x)=2x^3+9x^2-2x-9$. **[2]**

(*B*) Show that $g(1)=0$ and hence factorise $g(x)$ completely. **[5]**

[Question 12 is printed overleaf.]

12

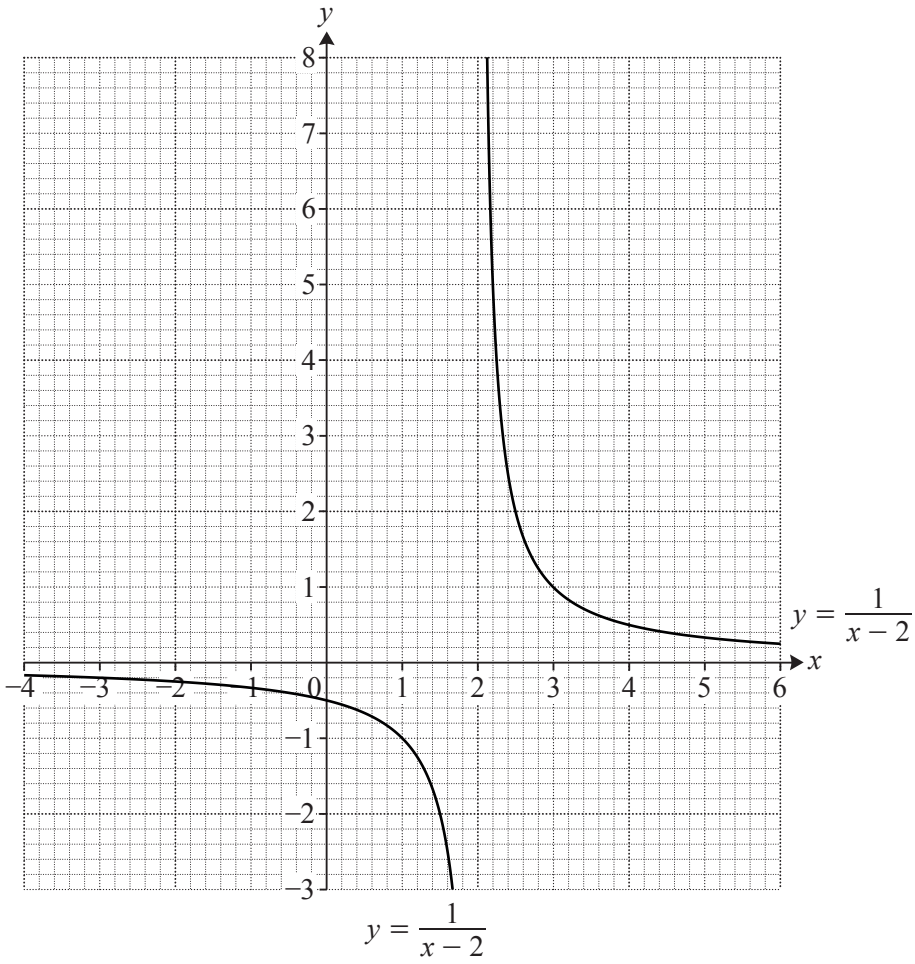


Fig. 12

Fig. 12 shows the graph of $y = \frac{1}{x-2}$.

(i) Draw accurately the graph of $y = 2x + 3$ on the copy of Fig. 12 and use it to estimate the coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = 2x + 3$. **[3]**

(ii) Show algebraically that the x-coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = 2x + 3$ satisfy the equation $2x^2 - x - 7 = 0$. Hence find the exact values of the x-coordinates of the points of intersection. **[5]**

(iii) Find the quadratic equation satisfied by the x-coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = -x + k$. Hence find the exact values of k for which $y = -x + k$ is a tangent to $y = \frac{1}{x-2}$. **[4]**