OCR
RECOGNISING ACHIEVEMENT

Friday 13 January 2012 – Morning

AS GCE MATHEMATICS (MEI)

4751 Introduction to Advanced Mathematics (C1)

QUESTION PAPER

4733606112

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4751
- 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

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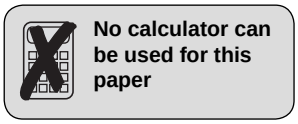

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Section A (36 marks)

1 Find the equation of the line which is perpendicular to the line $y = 5x + 2$ and which passes through the point (1, 6). Give your answer in the form $y = ax + b$. **[3]**

2 **(i)** Evaluate $9^{-\frac{1}{2}}$. **[2]**

(ii) Simplify $\dfrac{(4x^4)^3 y^2}{2x^2y^5}$. **[3]**

3 Expand and simplify $(n + 2)^3 - n^3$. **[3]**

4 **(i)** Expand and simplify $(7 + 3\sqrt{2})(5 - 2\sqrt{2})$. **[3]**

(ii) Simplify $\sqrt{54} + \dfrac{12}{\sqrt{6}}$. **[2]**

5 Solve the following inequality.

$$\frac{2x + 1}{5} < \frac{3x + 4}{6}$$ **[4]**

6 Rearrange the following equation to make h the subject.

$$4h + 5 = 9a - ha^2$$ **[3]**

7

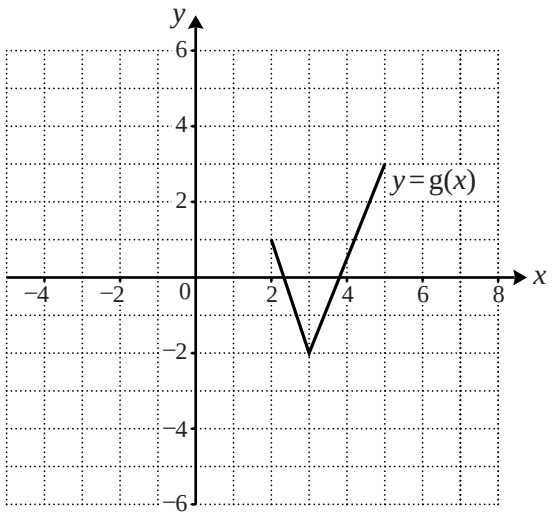

Fig. 7

Fig. 7 shows the graph of $y = g(x)$. Draw the graphs of the following.

(i) $y = g(x) + 3$ **[2]**

(ii) $y = g(x + 2)$ **[2]**

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8 Express $5x^2 + 15x + 12$ in the form $a(x + b)^2 + c$.

Hence state the minimum value of y on the curve $y = 5x^2 + 15x + 12$. **[5]**

9 Complete each of the following by putting the best connecting symbol ($\Leftrightarrow$, $\Leftarrow$ or $\Rightarrow$) in the box. Explain your choice, giving full reasons.

(i) $n^3 + 1$ is an odd integer ☐ n is an even integer **[2]**

(ii) $(x – 3)(x – 2) > 0$ ☐ $x > 3$ **[2]**

Section B (36 marks)

10 Point A has coordinates (4, 7) and point B has coordinates (2, 1).

(i) Find the equation of the line through A and B. **[3]**

(ii) Point C has coordinates (–1, 2). Show that angle ABC = 90° and calculate the area of triangle ABC. **[5]**

(iii) Find the coordinates of D, the midpoint of AC.

Explain also how you can tell, without having to work it out, that A, B and C are all the same distance from D. **[3]**

11 You are given that $f(x) = 2x^3 – 3x^2 – 23x + 12$.

(i) Show that $x = –3$ is a root of $f(x) = 0$ and hence factorise $f(x)$ fully. **[6]**

(ii) Sketch the curve $y = f(x)$. **[3]**

(iii) Find the x-coordinates of the points where the line $y = 4x + 12$ intersects $y = f(x)$. **[4]**

12 A circle has equation $(x – 2)^2 + y^2 = 20$.

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

(ii) Find the points of intersection of the circle with the y-axis and sketch the circle. **[3]**

(iii) Show that, where the line $y = 2x + k$ intersects the circle,

$$5x^2 + (4k – 4)\,x + k^2 – 16 = 0.$$ **[3]**

(iv) Hence find the values of k for which the line $y = 2x + k$ is a tangent to the circle. **[4]**

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THERE ARE NO QUESTIONS WRITTEN ON THIS PAGE.

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