Paper Reference(s)

6667/01

Edexcel GCE

Further Pure Mathematics FP1

Advanced Subsidiary/Advanced

Sample Assessment Material

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae	Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulas stored in them.

Instructions to Candidates

In the boxes on the answer book, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 9 questions in this question paper. The total mark for this paper is 75.
There are 4 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You should show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

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1. $f(x) = x^3 - 3x^2 + 5x - 4$

(a) Use differentiation to find $f'(x)$.

(2)

The equation $f(x) = 0$ has a root α in the interval $1.4 < x < 1.5$

(b) Taking 1.4 as a first approximation to α, use the Newton-Raphson procedure once to obtain a second approximation to α. Give your answer to 3 decimal places.

(4)

(Total 6 marks)

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2. The rectangle R has vertices at the points (0, 0), (1, 0), (1, 2) and (0, 2).

(a) Find the coordinates of the vertices of the image of R under the transformation given by the matrix $\mathbf{A} = \begin{pmatrix} a & 4 \\ -1 & 1 \end{pmatrix}$, where a is a constant.

(3)

(b) Find det **A**, giving your answer in terms of a.

(1)

Given that the area of the image of R is 18,

(c) find the value of a.

(3)

(Total 7 marks)

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3. The matrix **R** is given by $\mathbf{R} = \begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix}$

(a) Find $\mathbf{R}^2$.

(2)

(b) Describe the geometrical transformation represented by $\mathbf{R}^2$.

(2)

(c) Describe the geometrical transformation represented by **R**.

(1)

(Total 5 marks)

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4. $f(x) = 2^x - 6x$

The equation $f(x) = 0$ has a root α in the interval [4, 5].

Using the end points of this interval find, by linear interpolation, an approximation to α.

(Total 3 marks)

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5. (a) Show that $\sum_{r=1}^{n}(r^2 - r - 1) = \frac{1}{3}(n-2)n(n+2)$.

(6)

(b) Hence calculate the value of $\sum_{r=10}^{40}(r^2 - r - 1)$.

(3)

(Total 9 marks)

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6. Given that $z = -3 + 4i$,

(a) find the modulus of z,

(2)

(b) the argument of z in radians to 2 decimal places.

(2)

Given also that $w = \frac{-14 + 2i}{z}$,

(c) use algebra to find w, giving your answers in the form $a + ib$, where a and b are real.

(4)

The complex numbers z and w are represented by points A and B on an Argand diagram.

(d) Show the points A and B on an Argand diagram.

(2)

(Total 10 marks)

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7. The parabola C has equation $y^2 = 4ax$, where a is a constant.

The point $(4t^2, 8t)$ is a general point on C.

(a) Find the value of a.

(1)

(b) Show that the equation for the tangent to C at the point $(4t^2, 8t)$ is

$$yt = x + 4t^2.$$

(4)

The tangent to C at the point A meets the tangent to C at the point B on the directrix of C when $y = 15$.

(c) Find the coordinates of A and the coordinates of B.

(7)

(Total 12 marks)

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8. $$f(x) \equiv 2x^3 - 5x^2 + px - 5, \quad p \in \mathbb{R}$$

Given that $1 - 2i$ is a complex solution of $f(x) = 0$,

(a) write down the other complex solution of $f(x) = 0$,

(1)

(b) solve the equation $f(x) = 0$,

(6)

(c) find the value of p.

(2)

(Total 9 marks)

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9. Use the method of mathematical induction to prove that, for $n \in \mathbb{Z}^+$,

(a) $$\begin{pmatrix} 2 & 1 \\ -1 & 0 \end{pmatrix}^n = \begin{pmatrix} n+1 & n \\ -n & 1-n \end{pmatrix}$$

(7)

(b) $f(n) = 4^n + 6n - 1$ is divisible by 3.

(7)

(Total 14 marks)

TOTAL FOR PAPER: 75 MARKS

END

