Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	7	4	/	0	1	Signature	

Paper Reference(s)

6674/01

Edexcel GCE

Further Pure Mathematics FP1

Advanced/Advanced Subsidiary

Wednesday 20 June 2007 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Materials required for examination
Mathematical Formulae (Green)

Items included with question papers
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 above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
You must write your answer for each question in the space following the question.
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 7 questions in this question paper. The total mark for this question paper is 75.
There are 24 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. Find the set of values of x for which

$$\frac{x+1}{2x-3} < \frac{1}{x-3}.$$

(7)

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Question 1 continued

Q1

(Total 7 marks)

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2. $$\frac{dy}{dx} - y\tan x = 2\sec^3 x.$$

Given that $y = 3$ at $x = 0$, find y in terms of x.

(7)

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Question 2 continued

Q2

(Total 7 marks)

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3. (a) Show that

$$(r+1)^3-(r-1)^3 \equiv 6r^2+2.$$

(2)

(b) Hence show that

$$\sum_{r=1}^{n} r^2 = \frac{1}{6}n(n+1)(2n+1).$$

(5)

(c) Show that $\sum_{r=n}^{2n} r^2 = \frac{1}{6}n(n+1)(an+b)$, where a and b are constants to be found.

(4)

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Question 3 continued

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Question 3 continued

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Question 3 continued

(Total 11 marks)

Q3

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4. $$f(x) = x^3 + 8x - 19 \ .$$

(a) Show that the equation $f(x) = 0$ has only one real root.

(3)

(b) Show that the real root of $f(x) = 0$ lies between 1 and 2.

(2)

(c) Obtain an approximation to the real root of $f(x) = 0$ by performing two applications of the Newton-Raphson procedure to $f(x)$, using $x = 2$ as the first approximation. Give your answer to 3 decimal places.

(4)

(d) By considering the change of sign of $f(x)$ over an appropriate interval, show that your answer to part (c) is accurate to 3 decimal places.

(2)

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Question 4 continued

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Question 4 continued

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Question 4 continued

Q4

(Total 11 marks)

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5. For the differential equation

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 2x(x+3),$$

find the solution for which at $x = 0$, $\frac{dy}{dx} = 1$ and $y = 1$.

(12)

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Question 5 continued

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Question 5 continued

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Question 5 continued

Q5

(Total 12 marks)

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6. $$z = \sqrt{3} - \mathrm{i}.$$

z^* is the complex conjugate of z.

(a) Show that $\dfrac{z}{z^*} = \dfrac{1}{2} - \dfrac{\sqrt{3}}{2}\mathrm{i}$.

(3)

(b) Find the value of $\left|\dfrac{z}{z^*}\right|$.

(2)

(c) Verify, for $z = \sqrt{3} - \mathrm{i}$, that $\arg\dfrac{z}{z^*} = \arg z - \arg z^*$.

(4)

(d) Display z, z^* and $\dfrac{z}{z^*}$ on a single Argand diagram.

(2)

(e) Find a quadratic equation with roots z and z^* in the form $ax^2 + bx + c = 0$, where a, b and c are real constants to be found.

(2)

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Question 6 continued

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Question 6 continued

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Question 6 continued

Q6

(Total 13 marks)

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7. (a) Sketch the curve C with polar equation

$$r = 5 + \sqrt{3}\cos\theta, \qquad 0 \leqslant \theta < 2\pi.$$

(2)

(b) Find the polar coordinates of the points where the tangents to C are parallel to the initial line $\theta = 0$. Give your answers to 3 significant figures where appropriate.

(6)

(c) Using integration, find the area enclosed by the curve C, giving your answer in terms of π.

(6)

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Question 7 continued

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Question 7 continued

Q7

(Total 14 marks)

TOTAL FOR PAPER: 75 MARKS

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