| 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 30 January 2008 – Morning

Time: 1 hour 30 minutes

| Examiner's use only | | |
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| Team Leader's use only | | |
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| Question Number | Leave Blank |
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**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 formulae 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.
Marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
There are 8 questions in this question paper. The total mark for this question paper is 75.
There are 28 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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***Turn over***

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**1.** Solve the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} - 3y = x$$

to obtain $y$ as a function of $x$.

**(5)**

Leave blank

**Question 1 continued**

**(Total 5 marks)**

**Q1**

Leave blank

**2.** Given that $x = -\frac{1}{2}$ is the real solution of the equation

$$2x^3 - 11x^2 + 14x + 10 = 0,$$

find the two complex solutions of this equation.

**(6)**

Leave blank

**Question 2 continued**

**Q2**

**(Total 6 marks)**

Leave blank

**3.** (a) Simplify the expression $\frac{(x+3)(x+9)}{x-1}-(3x-5)$, giving your answer in the form

$\frac{a(x+b)(x+c)}{x-1}$, where $a$, $b$ and $c$ are integers.

**(4)**

(b) Hence, or otherwise, solve the inequality

$$\frac{(x+3)(x+9)}{x-1} > 3x-5.$$

**(4)**

**Question 3 continued**

Leave blank

**Question 3 continued**

Leave blank

**Question 3 continued**

Leave blank

**(Total 8 marks)**

**Q3**

Leave blank

**4.**

$$f(x) = 3x^2 + x - \tan\left(\frac{x}{2}\right) - 2, \qquad -\pi < x < \pi.$$

The equation f($x$) = 0 has a root $\alpha$ in the interval [0.7, 0.8].

(a) Use linear interpolation, on the values at the end points of this interval, to obtain an approximation to $\alpha$. Give your answer to 3 decimal places.

**(4)**

(b) Taking 0.75 as a first approximation to $\alpha$, apply the Newton–Raphson procedure once to f($x$) to obtain a second approximation to $\alpha$. Give your answer to 3 decimal places.

**(4)**

**Question 4 continued**

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**(Total 8 marks)**

**Q4**

Leave blank

**5.** (a) Express $\dfrac{5r+4}{r(r+1)(r+2)}$ in partial fractions.

**(4)**

(b) Hence, or otherwise, show that

$$\sum_{r=1}^{n} \frac{5r+4}{r(r+1)(r+2)} = \frac{7n^2+11n}{2(n+1)(n+2)}.$$

**(5)**

**Question 5 continued**

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**Question 5 continued**

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**Question 5 continued**

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**(Total 9 marks)**

**Q5**

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**6.** $z = -2 + \mathrm{i}.$

(a) Express in the form $a + \mathrm{i}b$

(i) $\frac{1}{z}$,

(ii) $z^2$.

**(4)**

(b) Show that $\left|z^2 - z\right| = 5\sqrt{2}$.

**(2)**

(c) Find arg $(z^2 - z)$.

**(2)**

(d) Display $z$ and $z^2 - z$ on a single Argand diagram.

**(2)**

**Question 6 continued**

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**Question 6 continued**

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**Question 6 continued**

**(Total 10 marks)**

**Q6**

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**7.** (a) Find the general solution of the differential equation

$$3\frac{\mathrm{d}^2y}{\mathrm{d}x^2}-\frac{\mathrm{d}y}{\mathrm{d}x}-2y=x^2.$$

**(8)**

(b) Find the particular solution for which, at $x=0$, $y=2$ and $\frac{\mathrm{d}y}{\mathrm{d}x}=3$.

**(6)**

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**Question 7 continued**

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**Question 7 continued**

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**Question 7 continued**

**(Total 14 marks)**

**Q7**

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**8.** **Figure 1**

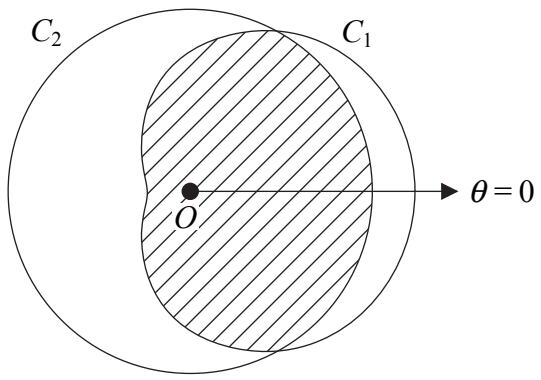


Figure 1 shows the curve $C_1$ which has polar equation $r = a(3 + 2\cos\theta)$, $0 \leqslant \theta < 2\pi$, and the circle $C_2$ with equation $r = 4a$, $0 \leqslant \theta < 2\pi$, where $a$ is a positive constant.

(a) Find, in terms of $a$, the polar coordinates of the points where the curve $C_1$ meets the circle $C_2$.

**(4)**

The regions enclosed by the curves $C_1$ and $C_2$ overlap and this common region $R$ is shaded in the figure.

(b) Find, in terms of $a$, an exact expression for the area of the shaded region $R$.

**(8)**

(c) In a single diagram, copy the two curves in Figure 1 and also sketch the curve $C_3$ with polar equation $r = 2a \cos \theta$, $0 \leqslant \theta < 2\pi$. Show clearly the coordinates of the points of intersection of $C_1$, $C_2$ and $C_3$ with the initial line, $\theta = 0$.

**(3)**

**Question 8 continued**

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**Question 8 continued**

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**Question 8 continued**

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**Q8**

**(Total 15 marks)**

**TOTAL FOR PAPER: 75 MARKS**

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