

Centre No.								Paper Reference			Surname	Initial(s)	
Candidate No.						6	6	6	8	/	0	1	Signature

Paper Reference(s)

**6668/01**

# Edexcel GCE

## Further Pure Mathematics FP2 Advanced/Advanced Subsidiary

Thursday 24 June 2010 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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### Materials required for examination

Mathematical Formulae (Pink)

### 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.

Question Number	Leave Blank
1	
2	
3	
4	
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7	
8	
<b>Total</b>	

### Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.

Check that you have the correct question paper.

Answer ALL the questions.

You must write your answer to 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 8 questions in this question paper. The total mark for this 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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Turn over

1. (a) Express  $\frac{3}{(3r-1)(3r+2)}$  in partial fractions. (2)

(b) Using your answer to part (a) and the method of differences, show that

$$\sum_{r=1}^n \frac{3}{(3r-1)(3r+2)} = \frac{3n}{2(3n+2)} \quad (3)$$

(c) Evaluate  $\sum_{r=100}^{1000} \frac{3}{(3r-1)(3r+2)}$ , giving your answer to 3 significant figures. (2)

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- 2. The displacement  $x$  metres of a particle at time  $t$  seconds is given by the differential equation

$$\frac{d^2x}{dt^2} + x + \cos x = 0$$

When  $t = 0$ ,  $x = 0$  and  $\frac{dx}{dt} = \frac{1}{2}$ .

Find a Taylor series solution for  $x$  in ascending powers of  $t$ , up to and including the term in  $t^3$ .

(5)

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3. (a) Find the set of values of  $x$  for which

$$x+4 > \frac{2}{x+3} \quad (6)$$

- (b) Deduce, or otherwise find, the values of  $x$  for which

$$x+4 > \frac{2}{|x+3|} \quad (1)$$

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5.

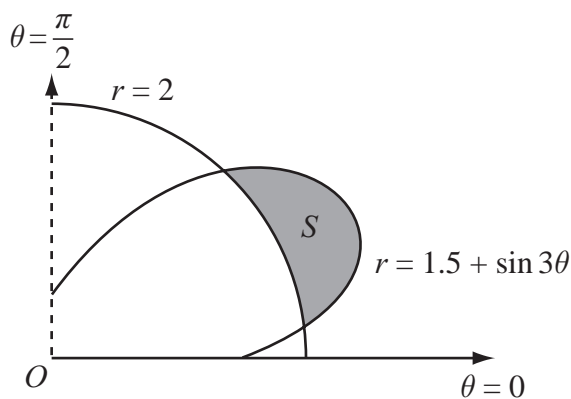


Figure 1

Figure 1 shows the curves given by the polar equations

$$r = 2, \quad 0 \leq \theta \leq \frac{\pi}{2},$$

and  $r = 1.5 + \sin 3\theta, \quad 0 \leq \theta \leq \frac{\pi}{2}.$

(a) Find the coordinates of the points where the curves intersect. (3)

The region  $S$ , between the curves, for which  $r > 2$  and for which  $r < (1.5 + \sin 3\theta)$ , is shown shaded in Figure 1.

(b) Find, by integration, the area of the shaded region  $S$ , giving your answer in the form  $a\pi + b\sqrt{3}$ , where  $a$  and  $b$  are simplified fractions. (7)

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6. A complex number  $z$  is represented by the point  $P$  in the Argand diagram.

(a) Given that  $|z-6|=|z|$ , sketch the locus of  $P$ . (2)

(b) Find the complex numbers  $z$  which satisfy both  $|z-6|=|z|$  and  $|z-3-4i|=5$ . (3)

The transformation  $T$  from the  $z$ -plane to the  $w$ -plane is given by  $w = \frac{30}{z}$ .

(c) Show that  $T$  maps  $|z-6|=|z|$  onto a circle in the  $w$ -plane and give the cartesian equation of this circle. (5)





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Question 6 continued

Lined writing area for the answer to Question 6.







8. (a) Find the value of  $\lambda$  for which  $y = \lambda x \sin 5x$  is a particular integral of the differential equation

$$\frac{d^2y}{dx^2} + 25y = 3 \cos 5x \tag{4}$$

- (b) Using your answer to part (a), find the general solution of the differential equation

$$\frac{d^2y}{dx^2} + 25y = 3 \cos 5x \tag{3}$$

Given that at  $x = 0$ ,  $y = 0$  and  $\frac{dy}{dx} = 5$ ,

- (c) find the particular solution of this differential equation, giving your solution in the form  $y = f(x)$ . (5)

- (d) Sketch the curve with equation  $y = f(x)$  for  $0 \leq x \leq \pi$ . (2)

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