

Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

# INTERNATIONAL AS FURTHER MATHEMATICS

(9665/FM01) Pure Maths Unit FP1

Tuesday 22 January 2019    07:00 GMT    Time allowed: 1 hour 30 minutes

**Materials**

- For this paper you must have the Oxford International AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

**Instructions**

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box on each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

**Advice**

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- Show all necessary working; otherwise marks may be lost.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



Answer **all** questions in the spaces provided.

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box

**1** A curve has equation  $y = x^3 - 12x$

**1 (a)** A line passes through two points on the curve.  
At one point  $x = -2$  and at the other point  $x = -2 + h$

Find the gradient of the line in the form  $ph + qh^2$ , where  $p$  and  $q$  are integers.

**[4 marks]**

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Answer \_\_\_\_\_

**1 (b)** Use your answer to part **(a)** to explain why the point on the curve where  $x = -2$  is a stationary point.

**[2 marks]**

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**2** The series  $S_n$  is defined for  $n \geq 2$  by

$$S_n = \sum_{r=1}^n (2r^3 + 3r^2 - 5r)$$

**2 (a)** Show that

$$S_n = kn(n + a)(n + b)(n + c)$$

where  $k$  is a fraction and  $a$ ,  $b$  and  $c$  are integers.

**[5 marks]**

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**2 (b)** Explain why  $S_n$  is always a multiple of 3

**[2 marks]**

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3 One of the roots of the quadratic equation

$$x^2 + 3x + c = 0$$

is  $p + 2i$ , where  $p$  and  $c$  are real numbers.

Find the value of  $p$  and the value of  $c$ .

[5 marks]

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$$p = \underline{\hspace{10cm}}$$

$$c = \underline{\hspace{10cm}}$$

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- 4** For each of the improper integrals below, either find its exact value or explain why it has no finite value.

Show all necessary working.

**4 (a)**  $\int_0^{12} \frac{1}{\sqrt{x}} dx$

**[3 marks]**

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Answer \_\_\_\_\_

**4 (b)**  $\int_0^{12} \frac{1}{x^4} dx$

**[3 marks]**

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Answer \_\_\_\_\_



**5 (a)** Find the general solution of the equation

$$\tan\left(\frac{x}{2} + \frac{\pi}{4}\right) = \frac{1}{\sqrt{3}}$$

**[4 marks]**

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Answer \_\_\_\_\_

**5 (b)** Find the **sum** of all the solutions of the equation

$$\tan\left(\frac{x}{2} + \frac{\pi}{4}\right) = \frac{1}{\sqrt{3}}$$

between  $-18\pi$  and  $18\pi$ .

Give your answer in terms of  $\pi$ .

**[5 marks]**

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Answer \_\_\_\_\_









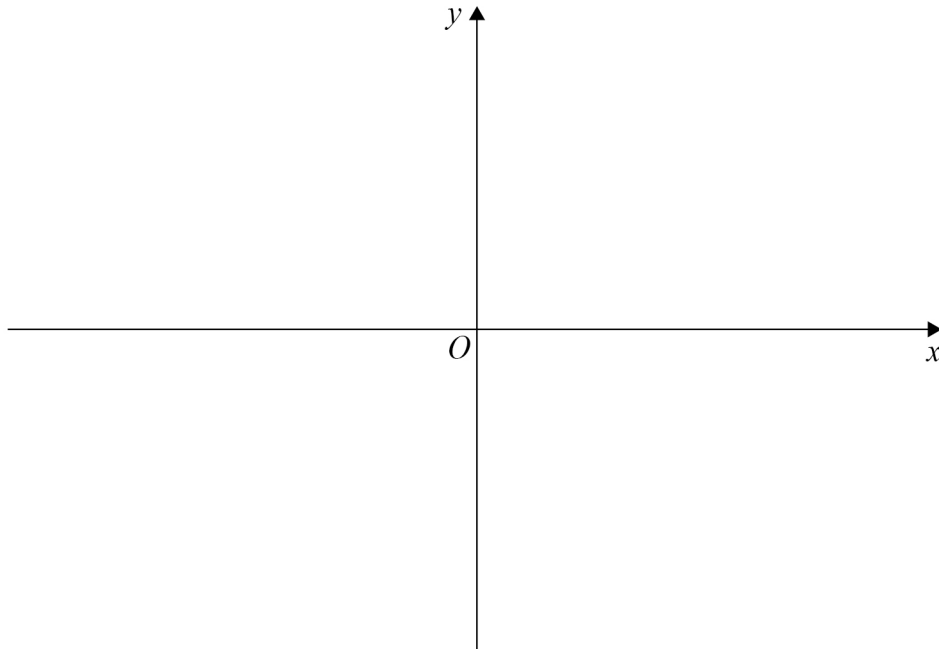




**8 (c)** Sketch  $C$  and  $L$  on the same axes.

You are given that  $C$  has no stationary points.

**[4 marks]**



**8 (d)** Solve the inequality

$$\frac{x-2}{x-3} \leq \frac{1}{2}x$$

**[2 marks]**

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Answer \_\_\_\_\_





9 (b) Find the coordinates of the points where  $E_2$  meets the  $x$ -axis.

[1 mark]

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Answer \_\_\_\_\_

9 (c) Show that, if the line  $y = mx + c$  meets the ellipse  $E_2$ , then

$$(3 + 4m^2)x^2 + (8mc - 48)x + (4c^2 + 144) = 0$$

[3 marks]

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Question 9 continues on the next page

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