

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname

Forename(s)

Candidate signature

INTERNATIONAL AS FURTHER MATHEMATICS

Further Pure Mathematics Unit 1

Thursday 31 May 2018

07:00 GMT

Time allowed: 1 hour 30 minutes

Materials

- For this paper you must have the booklet of formulae and statistical tables, which is included as an insert.
- 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 box 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 require extra space, use a supplementary answer book.
- 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	
10	
TOTAL	



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

Do not write
outside the
box

1 A curve has the equation $y = 2x^2 - 4x$

1 (a) A line passes through two points on the curve, one where $x = 3$ and the other where $x = 3 + h$

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

[3 marks]

Answer _____

1 (b) Show how the answer to part **(a)** can be used to find the gradient of the curve at the point where $x = 3$

State the value of this gradient.

[2 marks]

Answer _____

5



Also, $\frac{3-2i}{z} = a + ib$, where a and b are real.

[3 marks]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Answer

Turn over for the next question

3

Turn over ►



$$f(r) - f(r+1) = \frac{1}{(r+2)(r+3)}$$

3 (b) (i) find the exact value of

$$\sum_{r=11}^{30} \frac{1}{(r+2)(r+3)}$$

[illegible]

Answer



3 (b) (ii) show that

$$\sum_{r=18}^{\infty} \frac{1}{(r+2)(r+3)} = \frac{1}{m}$$

where m is an integer.

[4 marks]

9

Turn over for the next question

Turn over ►



- 4 Find the general solution of the equation

$$\cos\left(3x + \frac{\pi}{6}\right) = \frac{1}{\sqrt{2}}$$

giving your answer in terms of π .

[5 marks]

Answer

5



6 (a) Find the value of

$$\sum_{r=1}^{45} (2r)^2$$

[2 marks]

Answer _____

6 (b) Hence find the sum of the squares of all the odd numbers from 1 to 89

[3 marks]

Answer _____

5



Turn over for the next question

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►



7

$$x^2 - 4x + 7 = 0$$

has roots α and β .

7 (a)

[2 marks]

$$\alpha + \beta = \underline{\hspace{2cm}}$$

$$\alpha\beta = \underline{\hspace{10cm}}$$

7 (b)

[2 marks]

Answer



$$\alpha^4 + \beta^4 = -94$$

$$\alpha^2 + \frac{\beta}{\alpha} \quad \text{and} \quad \beta^2 + \frac{\alpha}{\beta}$$
[illegible]

Answer

Turn over ►



- 8 A hyperbola H_1 has equation

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

where a and b are positive constants.

H_1 intersects the x -axis at the points $(6, 0)$ and $(-6, 0)$

The asymptotes of H_1 have equations

$$y = \frac{2}{3}x \quad \text{and} \quad y = -\frac{2}{3}x$$

- 8 (a) Find the values of a and b .

[2 marks]

$a =$ _____

$b =$ _____



8 (b) The hyperbola H_1 is translated by the vector $\begin{bmatrix} 4 \\ 0 \end{bmatrix}$ to give the hyperbola H_2

8 (b) (i) Write down the equation of H_2

[1 mark]

Answer

8 (b) (ii) Show that, if the line $y = mx$ intersects H_2 , then the x -coordinates of the points of intersection must satisfy the equation

$$(4 - 9m^2)x^2 - 32x - 80 = 0$$

[3 marks]

Question 8 continues on the next page

Turn over ►



[5 marks]

[illegible]

11



Turn over for the next question

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►



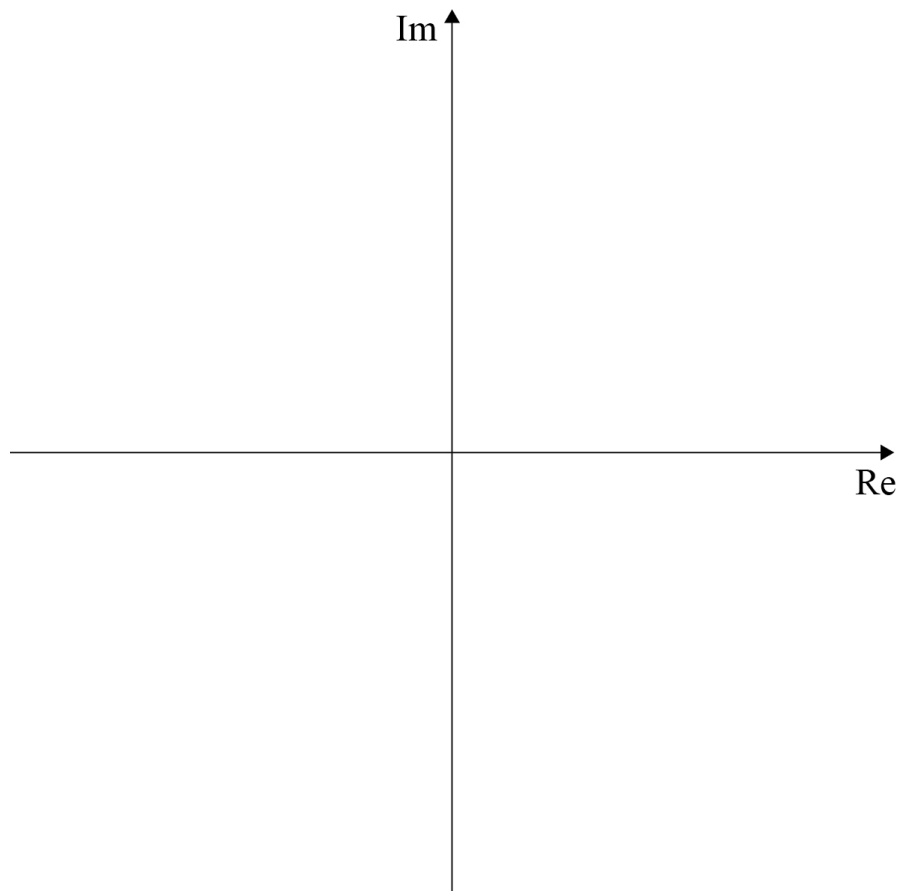
9 The locus L of points satisfies the equation $|z| = |z - 4 - 4i|$

The point P represents the complex number $4 + 4i$

The circle C has centre P and touches L .

9 (a) Sketch L and C on the same Argand diagram in the space below.

[4 marks]



9 (b) Given that z_1 lies on C , find the maximum possible value of $|z_1|$

[3 marks]

Answer _____

9 (c) Given that z_2 lies on C , find the minimum possible value of $\arg(z_2)$

[3 marks]

Answer _____

10

Turn over ►



10 A curve C has the equation

$$y = \frac{(x+5)(x+1)}{x(x-4)}$$

10 (a) State the equations of the asymptotes of C .

[3 marks]

Answer _____



10 (b) (i) Show that

[4 marks]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Turn over ►



No credit will be given for solutions using differentiation.

[illegible]

12

Copyright information

For confidentiality purposes, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.oxfordqaexams.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and Oxford International AQA Examinations will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 Oxford International AQA Examinations and its licensors. All rights reserved.

