

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname _____

Forename(s) _____

Candidate signature _____

INTERNATIONAL A-LEVEL MATHEMATICS

(9660/MA03) Unit P2 – Pure Mathematics

Wednesday 29 May 2019 07:00 GMT Time allowed: 2 hours 30 minutes

Materials

- For this paper you must have the Oxford International AQA booklet of formulae and statistical tables (enclosed).
- 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 around 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 120.

Advice

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

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
TOTAL	



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

- 1 (a)** Use Simpson's rule with 7 ordinates (6 strips), to find an estimate for $\int_0^3 3^x dx$, giving your answer to 3 decimal places.

[4 marks]

Answer _____

- 1 (b)** A curve is defined by the equation $y = 3^x$
The curve intersects the line $y = 12 - 4x$ at a single point where $x = \alpha$

- 1 (b) (i)** Show that α lies between 1.5 and 1.6

[2 marks]



1 (b) (ii) The equation $3^x = 12 - 4x$ can be rearranged into the form $x = \frac{\ln(12 - 4x)}{\ln 3}$

Use the iterative formula

$$x_{n+1} = \frac{\ln(12 - 4x_n)}{\ln 3}$$

with $x_1 = 1.5$ to find the values of x_2 and x_3 , giving your answers to 3 decimal places.

[2 marks]

$$x_2 = \underline{\hspace{2cm}} \quad x_3 = \underline{\hspace{2cm}}$$

8

Turn over for the next question

Turn over ►



2 (a) The number of fish in Lake P decreases by 3% each year.

On 1 January 2019 there are 50 000 fish in this lake.

Calculate, to the nearest 100, the number of fish in this lake on

2 (a) (i) 1 January 2020,

[1 mark]

Answer _____

2 (a) (ii) 1 January 2029,

[2 marks]

Answer _____

2 (a) (iii) 1 January 2009.

[2 marks]

Answer _____



7 (a) Given that $x = \frac{1}{\cos \theta}$, use the quotient rule to show that $\frac{dx}{d\theta} = \sec \theta \tan \theta$

[2 marks]

7 (b) Use the substitution $x = 2 \sec \theta$, to find the exact value of $\int_{\frac{4\sqrt{3}}{3}}^4 \frac{1}{x^2 \sqrt{x^2 - 4}} dx$

[7 marks]

Answer _____

9

Turn over ►



9 The function f is defined by

$$f(x) = |x^2 - 5| - 3 \text{ for } -5 \leq x \leq 5$$

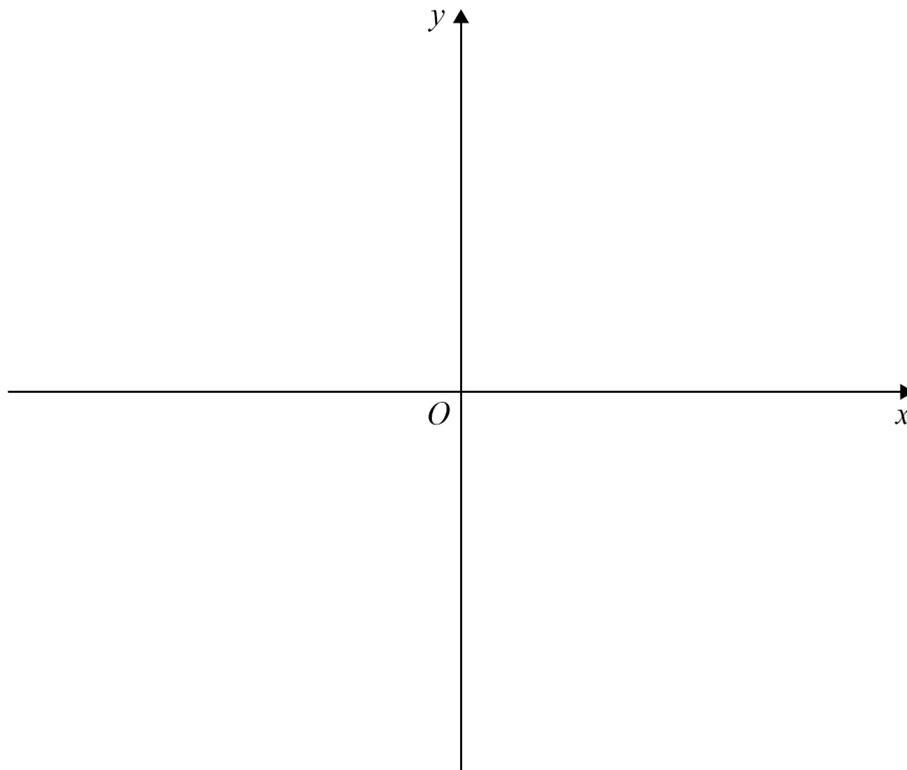
9 (a) (i) Write down the range of f .

[1 mark]

Answer _____

9 (a) (ii) Sketch the graph of $y = f(x)$, indicating the value where the curve crosses the y -axis.

[3 marks]



9 (a) (iii) Solve $f(x) = 1$

[3 marks]

Answer _____

9 (b) The function g is defined by

$$g(x) = \frac{1}{x} \quad \text{where } x \neq 0$$

9 (b) (i) Find an expression for $fg(x)$.

[1 mark]

Answer _____

9 (b) (ii) Solve $fg(x) < 0$

[3 marks]

Answer _____



10 It is given that

$$\frac{dy}{dx} = \frac{y}{\sqrt{2x-1}} \quad \text{where } x > 0.5$$

10 (a) Solve the differential equation such that $y = 1$ when $x = 5$

[4 marks]

Answer _____

10 (b) Hence find the value of x when $y = e^4$

[2 marks]

Answer _____



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 ►



There are no questions printed on this page

*Do not write
outside the
box*

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



There are no questions printed on this page

*Do not write
outside the
box*

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

Copyright information

For confidentiality purposes, acknowledgements of third-party copyright material are 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.oxfordaqaexams.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 © 2019 Oxford International AQA Examinations and its licensors. All rights reserved.



3 2



1 9 6 X M A 0 3

IB/M/Jun19/MA03