OXFORD

INTERNATIONAL AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

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Candidate signature _____

INTERNATIONAL AS
FURTHER MATHEMATICS

(9665/FM01) Unit FP1 – Pure Maths

Tuesday 28 May 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 (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 80.

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

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

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

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1 (a) Expand $(2 + h)^4$

[1 mark]

Answer _____

1 (b) A curve has equation $y = x^4 + x^2$

1 (b) (i) A line passes through two points on the curve, one where $x = 2$ and the other where $x = 2 + h$

Find the gradient of this line, giving your answer in its simplest form.

[3 marks]

Answer _____

Do not write outside the box

1 (b) (ii) Show how the answer to part **(b)(i)** can be used to find the gradient of the curve at the point where $x = 2$

State the value of this gradient.

[2 marks]

Answer _____

6

Turn over for the next question

Do not write outside the box

2 It is given that $f(x) = x^2 + bx + c$, where b and c are real.

One root of $f(x) = 0$ is $3z - z^*$, where $z = 2 + 5i$

Find the value of b and the value of c.

[4 marks]

$b =$ _____

$c =$ _____

4

Do not write outside the box

3 (a) Given that $f(r) = r^3 + r^2$, show that

$$f(r + 1) - f(r) = (r + 1)(ar + b)$$

where a and b are integers.

[3 marks]

3 (b) Hence find the value of

$$25 \times 74 + 26 \times 77 + 27 \times 80 + \ldots + 62 \times 185 + 63 \times 188$$

[4 marks]

Answer _____

7

Do not write outside the box

4 (a) Find the general solution of the equation

$$\sin\left(4x-\frac{\pi}{6}\right)=-\frac{\sqrt{3}}{2}$$

giving your answer in terms of π.

[5 marks]

Answer _____

4 (b) Find the least solution of the equation in part **(a)** which is greater than 7π.

[2 marks]

Answer _____

7

Do not write outside the box

5 By considering the derivative of $y = x^{-2}$ when $x = 2$,

find an estimate for $\dfrac{1}{2.08^2}$

[6 marks]

Answer _____

6

Turn over for the next question

Do not write outside the box

6 The quadratic equation

$$3x^2 + 5x + 9 = 0$$

has roots α and β.

6 (a) Write down the value of $\alpha + \beta$ and the value of $\alpha\beta$

[2 marks]

$\alpha + \beta =$ _____

$\alpha\beta =$ _____

6 (b) Find the value of $\alpha^2 + \beta^2$

[2 marks]

Answer _____

Do not write outside the box

6 (c) Find a quadratic equation, with integer coefficients, which has roots

$$\frac{\alpha}{\beta+1} \quad \text{and} \quad \frac{\beta}{\alpha+1}$$

[6 marks]

Answer _____

10

Turn over ►

Do not write outside the box

7 A parabola P_1 has equation $y^2 = 6x$

P_1 is mapped onto a parabola, P_2, by a stretch of scale factor k parallel to the x-axis, where $k > 0$

7 (a) Show that if P_2 meets the line $y = x + 5$ at the point A, then the x-coordinate of A satisfies the equation

$$kx^2 + (10k - 6)x + 25k = 0$$

[3 marks]

7 (b) Given that $y = x + 5$ is a tangent to P_2, find the equation of P_2 in the form $y^2 = px$

[4 marks]

Answer _____

7

Do not write outside the box

8 (a) Find in terms of q and r, where $0 < q < r$,

$$\int_q^r \frac{1}{\sqrt[3]{x}}\,\mathrm{d}x$$

[3 marks]

Answer

8 (b) Explain why only **one** of the improper integrals

$$I_1 = \int_0^8 \frac{1}{\sqrt[3]{x}}\,\mathrm{d}x$$

and

$$I_2 = \int_8^\infty \frac{1}{\sqrt[3]{x}}\,\mathrm{d}x$$

has a finite value, and find that value.

[3 marks]

Answer

6

Turn over ►

Do not write outside the box

9 A curve C has equation

$$y = \frac{x+2}{(x-1)(x+4)}$$

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

[2 marks]

Answer _____

9 (b) Prove that the line $y = k$ intersects the curve C for all real values of k.

No credit will be given for solutions using differentiation.

[5 marks]

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9 (c) Find the coordinates of the points where the curve C meets the line $y = x + 2$

[3 marks]

Answer _____

9 (d) Sketch on the same axes the curve C and the line $y = x + 2$, showing the coordinates of the points of intersection of C with the axes.

[4 marks]

14

Turn over for the next question

Do not write outside the box

10 On an Argand diagram the point P represents the complex number $2 + 2\mathrm{i}$ and the point Q represents the complex number $4 + \mathrm{i}$

Both P and Q lie on a circle C with centre S.

S lies on the line $\mathrm{Im}(z) = 0$

10 (a) Find the equation of C, giving your answer in the form $|z - z_0| = k$

Show all your working.

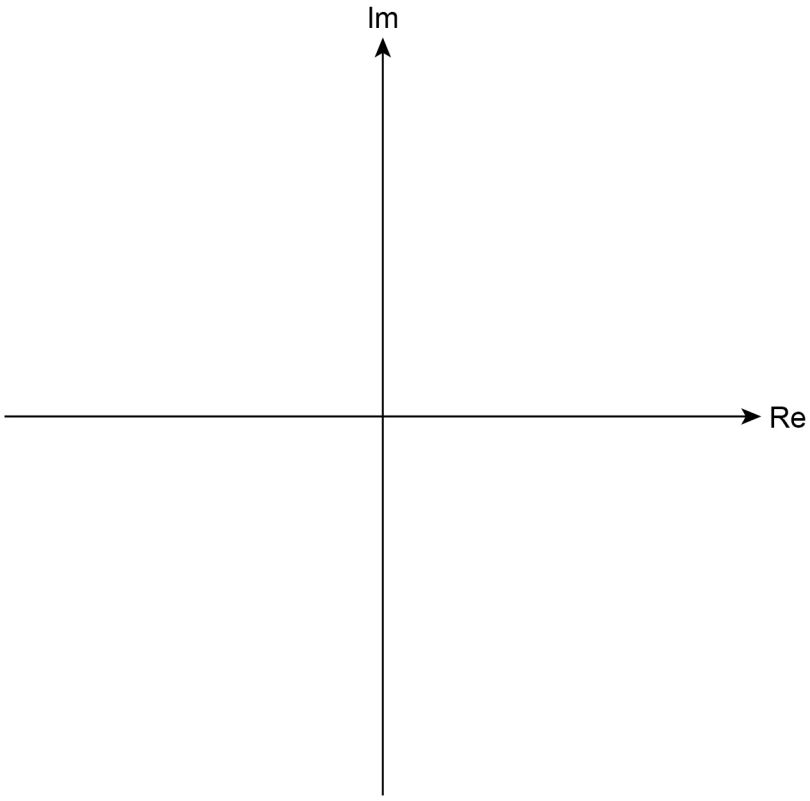
[6 marks]

Answer _____

Do not write outside the box

10 (b) Draw the circle C on the Argand diagram.

[2 marks]



10 (c) The point T lies on C and represents the complex number z_1, which has the greatest argument of any point on C.

Find z_1 in the form $z_1 = \frac{1}{a}\left(b + i\sqrt{c}\right)$, where a, b and c are integers.

[5 marks]

Question 10(c) continues on the next page

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Answer _____

13

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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