

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

INTERNATIONAL AS FURTHER MATHEMATICS

(9665/FM01) Unit FP1 Pure Mathematics

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 graphic 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.

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.

1 A curve has equation $y = x^3 - 4x^2$

1 (a) A line passes through two points on the curve, one where $x = 6$
and the other where $x = 6 + h$

Find the gradient of this line in the form $a + bh + h^2$, where a and b are constants.

[4 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 $x = 6$

State the value of this gradient.

[2 marks]

Answer _____



It is given that $z = \frac{a+4i}{7+bi}$, where a and b are real numbers.

Give your answers in terms of a and b

[illegible]
$$\operatorname{Im}(z) =$$

4

$$\tan\left(3x - \frac{\pi}{6}\right) = 1$$

[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 _____



3 (b) Find the general solution of the equation

$$\tan^2\left(3x - \frac{\pi}{6}\right) = 1$$

giving your answer in terms of π

[3 marks]

Answer _____

6

Turn over ►



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ANSWER IN THE SPACES PROVIDED**



- 4 (a) Explain why $\int_0^{16} x^{-\frac{1}{4}} dx$ is an improper integral.

[1 mark]

- 4 (b) Find the exact value of the improper integral $\int_0^{16} x^{-\frac{1}{4}} dx$

[3 marks]

Answer _____

4

Turn over ►



5

$$S_n = \sum_{r=2}^n \left(\frac{1}{(r-1)^2} - \frac{1}{(r+1)^2} \right)$$

5 (a)

$$S_n = \frac{a}{b} - \frac{f(n)}{n^2(n+1)^2}$$

where a and b are integers and f is a function of n

[4 marks]

[illegible]

$$\sum_{r=11}^{\infty} \left(\frac{1}{(r-1)^2} - \frac{1}{(r+1)^2} \right)$$

[4 marks]

[illegible]

Answer _____



[3 marks]

[illegible]

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

[2 marks]



[6 marks]

$$\alpha - \frac{1}{\beta^2} \quad \text{and} \quad \beta - \frac{1}{\alpha^2}$$

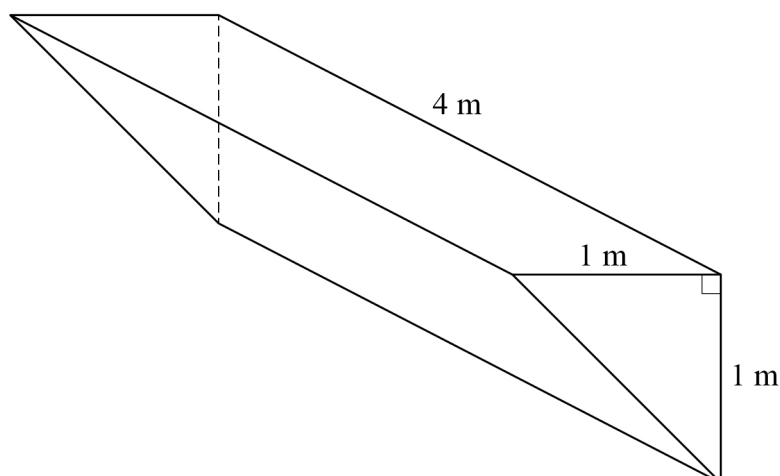
[illegible]

Answer

Turn over ►



- 7 A water tank is in the shape of a triangular prism.



The length of the tank is 4 metres.

The cross-section of the tank is a right-angled triangle.

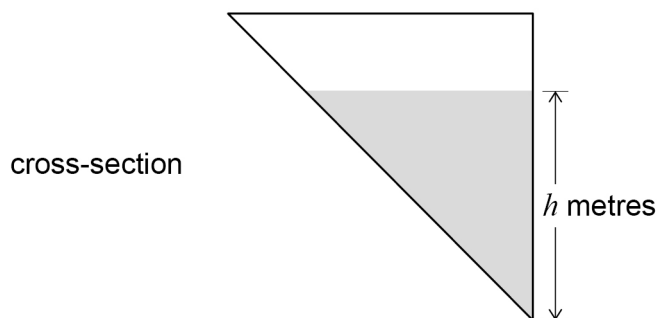
One side of the triangle is vertical and has length 1 metre.

Another side of the triangle is horizontal and has length 1 metre.

- 7 (a) The tank contains water.

The height of the water is h metres.

The volume of water in the tank is $V \text{ m}^3$



Find an expression for V in terms of h

[1 mark]

$V =$ _____



Find the rate at which the **height** of the water is decreasing when the height of the water is 0.75 metres.

[5 marks]

[illegible]

Answer

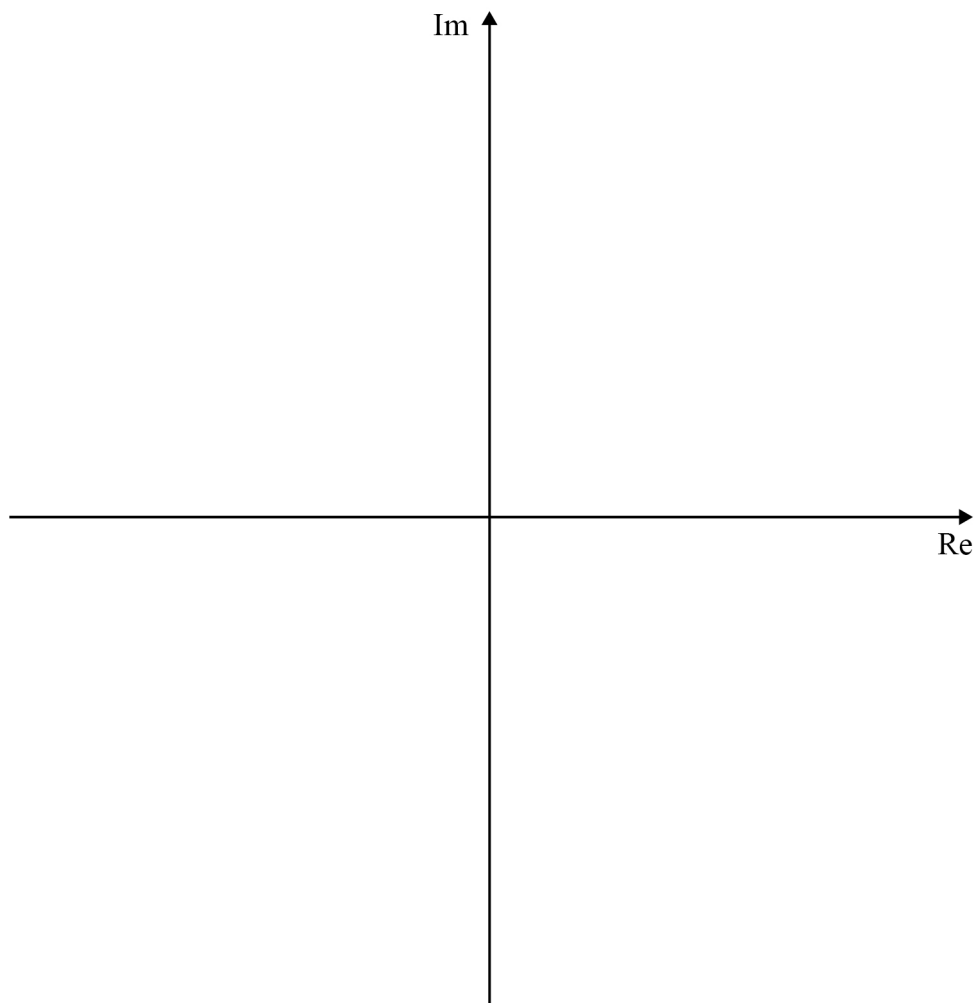
6

- 8 The circle C is the locus of points on an Argand diagram such that

$$|z + 5 - 6i| = 2$$

- 8 (a) Draw the circle C on the Argand diagram showing clearly both its centre and radius.

[2 marks]



Find z_1

[illegible]

$$\frac{\quad}{7}$$

9 The function f is defined by

$$f(x) = \frac{4x+7}{x+2}$$

9 (a) Write down the equations of the asymptotes of the graph of $y = f(x)$

[2 marks]

Answer _____

9 (b) Find the exact values of the coordinates of the points of intersection of the graph of $y = f(x)$ with the line $y = x - 2$

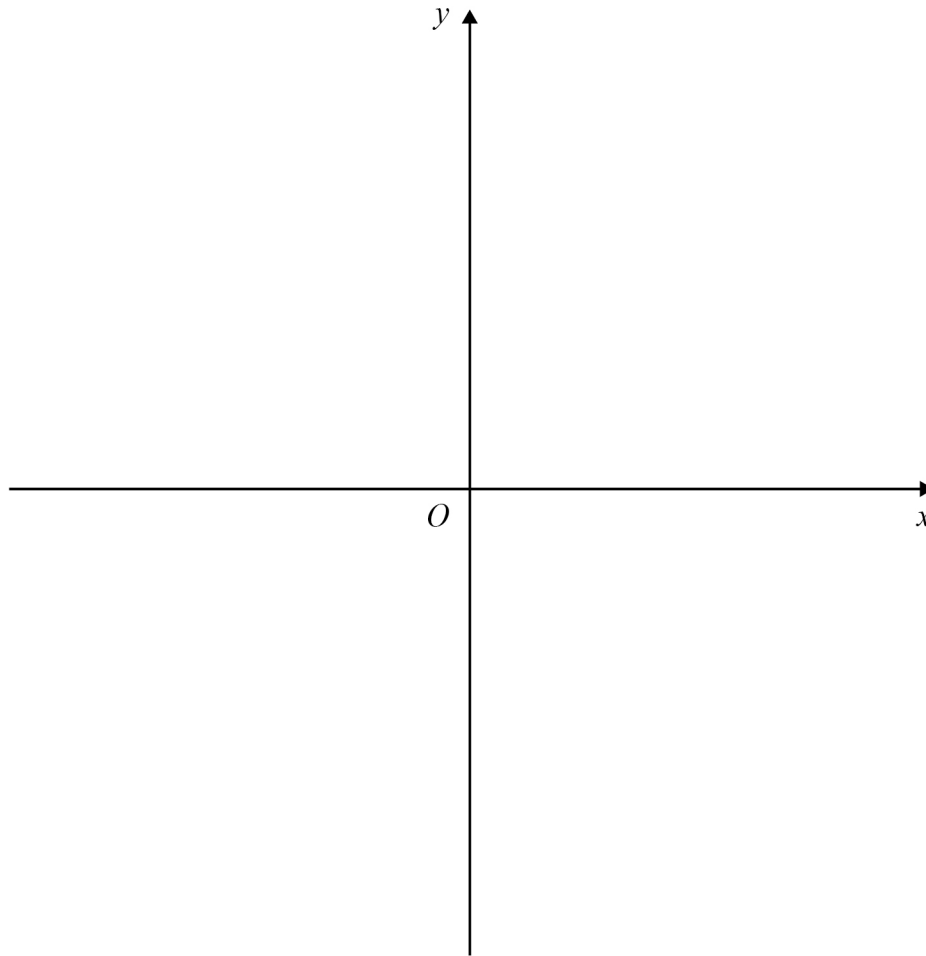
[4 marks]

Answer _____



- 9 (c) Sketch the graph of $y = f(x)$ and the line $y = x - 2$ on the axes below.

[4 marks]



- 9 (d) Solve the inequality

$$\frac{4x+7}{x+2} \leq x-2$$

[2 marks]

Answer _____

12

Turn over ►



10

The circle C_2 has equation $(x-7)^2 + y^2 = 1$

10 (a)

[2 marks]

10 (b)

Find the set of possible values of m

No credit will be given for solutions using differentiation.

[6 marks]

Answer



10 (c) (i) State what type of curve C_3 is.

Answer

[1 mark]

Answer

[6 marks]

[illegible]

Answer

END OF QUESTIONS

16



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2 4



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