

Please write clearly in block capitals.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL A-LEVEL

MATHEMATICS

(9660/MA03) Unit P2 Pure Mathematics

Friday 22 May 2026

08:00 UK Time

Time allowed: 2 hours 30 minutes

Materials

- For this paper you must have the OxfordAQA Booklet of Formulae and Statistical Tables (enclosed).
- You may use a graphical 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 may be lost.

For Examiner's Use	
Question	Mark
1	
2	
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10	
11	
12	
13	
14	
15	
TOTAL	



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

1 (a) It is given that $y = (2 - 5x^6)^9$

Find $\frac{dy}{dx}$

[2 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$

1 (b) It is given that $y = x \ln(3x - 1)$

Find $\frac{dy}{dx}$

[2 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$



1 (c) It is given that $y = \frac{4x^3}{1-5x}$

Show that $\frac{dy}{dx} = \frac{ax^2(b-10x)}{(1-5x)^2}$ where a and b are constants.

[3 marks]

7

Turn over for the next question

Turn over ►



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- 2 (a)** Describe a sequence of **two** geometrical transformations that maps the graph of $y = f(x)$ onto the graph of $y = 2f(x - 1)$

[4 marks]

- 2 (b)** The minimum point of the curve with equation $y = f(x)$ has coordinates $(-2, 6)$

Find the coordinates of the minimum point of the curve with equation $y = 2f(x - 1)$

[2 marks]

Answer _____

6

Turn over for the next question

Turn over ►



3 A curve C has equation $y = e^{-x}$ and a curve D has equation $y = 1.5 - 0.3x^3$

3 (a) (i) For $x < 0$, the curves C and D intersect at a point where $x = \alpha$

Show that α lies between -1 and -0.1

[2 marks]

3 (a) (ii) Show that the equation $e^{-x} = 1.5 - 0.3x^3$ can be rearranged into the form

$$x = -\ln(1.5 - 0.3x^3)$$

[1 mark]

3 (a) (iii) Use the iterative formula

$$x_{n+1} = -\ln(1.5 - 0.3x_n^3)$$

with $x_1 = -1$ to find the value of x_2 and the value of x_3

Give your values correct to three decimal places.

[2 marks]

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



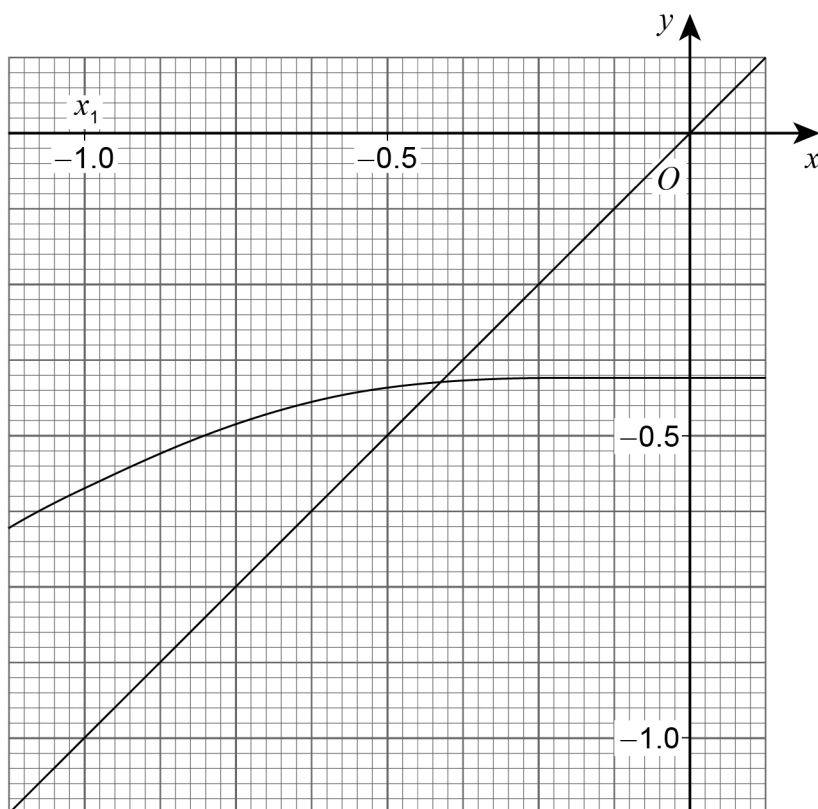
3 (b) **Figure 1** shows parts of the graphs of

$$y = -\ln(1.5 - 0.3x^3) \text{ and } y = x, \text{ and the position of } x_1$$

On **Figure 1**, draw a cobweb or staircase diagram to show how convergence takes place, indicating the position of x_2 and the position of x_3 on the x -axis.

[2 marks]

Figure 1



Turn over for the next question



4 The polynomial $p(x)$ is defined by $p(x) = 12x^3 + kx + 1$ where k is a constant.

When $p(x)$ is divided by $(2x + 1)$ the remainder is R

When $p(x)$ is divided by $(x - 1)$ the remainder is $4R$

4 (a) Show that $k = -5$

[3 marks]

4 (b) Use the Factor Theorem to show that $(2x - 1)$ is a factor of $p(x)$

[1 mark]

4 (c) Show that $p(x) = 0$ has only one rational root.

[2 marks]



- 5** A radioactive substance decays so that its mass m grams at time t hours is given by $m = Pe^{-\frac{t}{30}}$ where P is the initial mass of the substance in grams.

- 5 (a)** Find the time taken in hours for the mass of the substance to reduce from P to $0.75P$.
Give your answer correct to one decimal place.

[3 marks]

Answer _____

- 5 (b)** Find the percentage change in the mass of the substance after 24 hours.
Give your answer correct to one decimal place.

[2 marks]

Answer _____

5

**Turn over ►**

6 The functions f and g are defined by

$$f(x) = \frac{8}{4x-1} \text{ for all real values of } x \neq 0.25$$

$$g(x) = x^2 - 1 \text{ for all real values of } x$$

6 (a) State the range of the function g

[1 mark]

Answer

6 (b) (i) Find $fg(x)$

[1 mark]

$fg(x) =$

6 (b) (ii) Find the domain of the function fg

[1 mark]

Answer



6 (b) (iii) Solve the equation $fg(x) = 8$

Give your answers in surd form.

[2 marks]

Answer _____

6 (c) The inverse of the function f is f^{-1}

6 (c) (i) Find $f^{-1}(x)$

[3 marks]

$f^{-1}(x) =$ _____

6 (c) (ii) Solve the equation $f(x) = f^{-1}(x)$

Give your answers in surd form.

[3 marks]

Answer _____



[7 marks]

[illegible]

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Answer _____

7

Turn over ►



- 8 (a) (i)** It is given that $8\cos\theta + 6\sin\theta = R\cos(\theta - \alpha)$ where θ and α are measured in degrees.

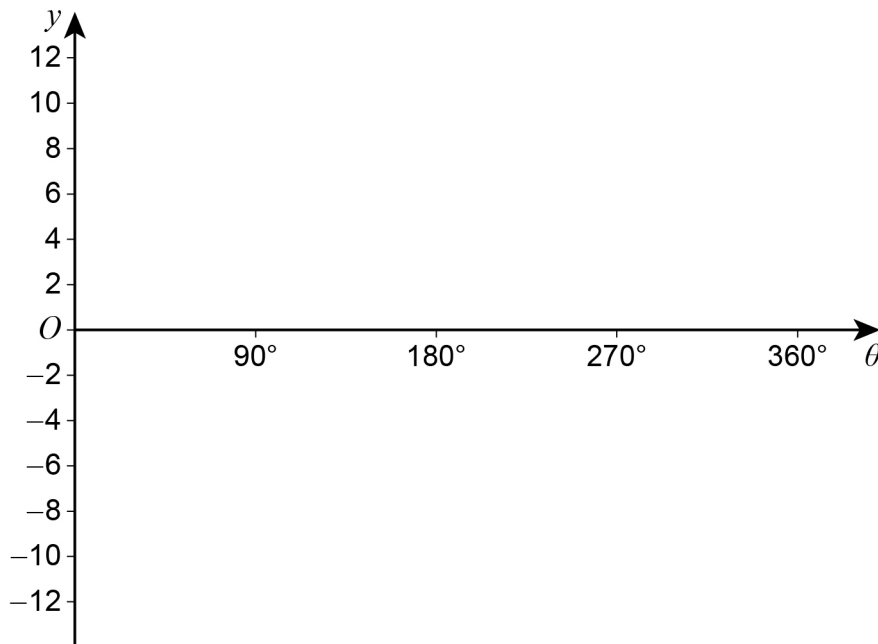
Show that $R = 10$ and show that $\alpha = 37^\circ$ correct to the nearest degree.

[2 marks]

- 8 (a) (ii)** On **Figure 2**, sketch the graph of $y = |8\cos\theta + 6\sin\theta|$ for $0^\circ \leq \theta \leq 360^\circ$

[2 marks]

Figure 2



- 8 (a) (iii)** Find the greatest value of $15 - |8\cos\theta + 6\sin\theta|$ for $0^\circ \leq \theta \leq 360^\circ$

[1 mark]

Answer _____



8 (b) Solve the equation

$$8 \tan^2(x - 60^\circ) = 2 \sec(x - 60^\circ) + 7 \quad \text{for} \quad -180^\circ < x < 180^\circ$$

Give all solutions in the interval to the nearest degree.

[5 marks]

Answer _____

8 (c) It is given that $2 \operatorname{cosec} y = \sec\left(y + \frac{\pi}{6}\right)$

Find the value of $\cot y$

Give your answer in an exact form.

[4 marks]

Answer _____



Give your answer in the form $y\sqrt{e} = ax + b$, where a and b are rational numbers.

[4 marks]

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Answer



9 (b)

The **normal** to the curve $y = e^{3x-2}$ at P intersects the x -axis at the point A and the y -axis at the point B

Show that the area of the triangle OAB is $\frac{(m+e)^2}{24e^n}$ where m and n are rational numbers.

[6 marks]

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It is given that $y \sin x = e^{-2x}$

[5 marks]

[illegible]

Use the substitution $u = x^2 - 8$ to find the value of $\int_3^4 \frac{2x^3}{\sqrt{x^2 - 8}} dx$

[7 marks]

[illegible]

Answer

7

Turn over ►



12 (a) (i) Find the binomial expansion of $(4 + 3x)^{-1}$ up to and including the term in x^2

[2 marks]

Answer _____

12 (a) (ii) State the values of x for which the binomial expansion found in **part (a)(i)** is valid.

[1 mark]

Answer _____

12 (b) Use partial fractions to show that

$$\frac{80}{(2-x)(16-9x^2)} = P + Qx + Rx^2$$

for small values of x , where P , Q and R are constants.

[9 marks]



[illegible]

Answer _____

12

It is given that

Solve the differential equation given that $y = 1$ when $x = 1$

Give your answer in the form $y = f(x)$

[illegible]

8



The point A has coordinates $(2, 0, 1)$

Find the shortest distance from A to the line l

[6 marks]

[illegible]

Answer



15

$x = at^2$ and $y = 2at$ where a is a constant.

15 (a)

Give your answer in the form $y^2 = f(x)$

[2 marks]

Answer

15 (b)

[3 marks]



15 (c) (i) Show that $p^2 + pq + 2 = 0$

Find the value of p^2 when q^2 takes its minimum value.

[illegible]

END OF QUESTIONS

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