GradeMax

Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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MATHEMATICS **9709/23**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.

This document consists of **15** printed pages and **1** blank page.

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1 Solve the inequality $|3x - 2| < |x + 5|$. [4]

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2 A curve has equation $y = 3\ln(2x + 9) - 2\ln x$.

(i) Find the x-coordinate of the stationary point. [4]

(ii) Determine whether the stationary point is a maximum or minimum point. [2]

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[Turn over

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3 **(i)** Find the quotient when

$$x^4 - 2x^3 + 8x^2 - 12x + 13$$

is divided by $x^2 + 6$ and show that the remainder is 1. [3]

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(ii) Show that the equation

$$x^4 - 2x^3 + 8x^2 - 12x + 12 = 0$$

has no real roots. [3]

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4 **(i)** Solve the equation $2\ln(2x) - \ln(x+3) = 4\ln 2$. [5]

(ii) Hence solve the equation

$$2\ln(2^{u+1}) - \ln(2^u + 3) = 4\ln 2,$$

giving the value of u correct to 4 significant figures. [2]

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5 A curve has equation

$$y^3 \sin 2x + 4y = 8.$$

Find the equation of the tangent to the curve at the point where it crosses the y-axis. [6]

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6 It is given that $\int_0^a \left(1 + e^{\frac{1}{2}x}\right)^2 \, dx = 10$, where a is a positive constant.

(i) Show that $a = 2 \ln \left(\frac{15 - a}{4 + e^{\frac{1}{2}a}} \right)$. [6]

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(ii) Use the equation in part **(i)** to show by calculation that $1.5 < a < 1.6$. [2]

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(iii) Use an iterative formula based on the equation in part **(i)** to find the value of a correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

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7 **(i)** Show that $2\,\text{cosec}^2 2x(1 - \cos 2x) \equiv \sec^2 x$. [3]

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(ii) Solve the equation $2\,\text{cosec}^2 2x(1 - \cos 2x) = \tan x + 21$ for $0 < x < \pi$, giving your answers correct to 3 significant figures. [4]

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(iii) Find $\int [2\,\mathrm{cosec}^2(4y+2) - 2\,\mathrm{cosec}^2(4y+2)\cos(4y+2)]\,\mathrm{d}y$. [3]

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Additional Page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.

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