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Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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9071290074

MATHEMATICS **9709/21**

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 **14** printed pages and **2** blank pages.

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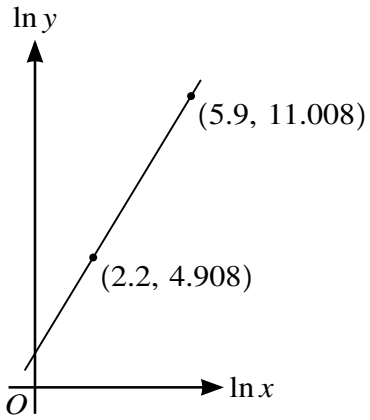
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1 Solve the equation $3e^{2x} - 82e^{x} + 27 = 0$, giving your answers in the form $k \ln 3$. [5]

2



The variables x and y satisfy the equation $y = A \times B^{\ln x}$, where A and B are constants. The graph of $\ln y$ against $\ln x$ is a straight line passing through the points (2.2, 4.908) and (5.9, 11.008), as shown in the diagram. Find the values of A and B correct to 2 significant figures. [5]

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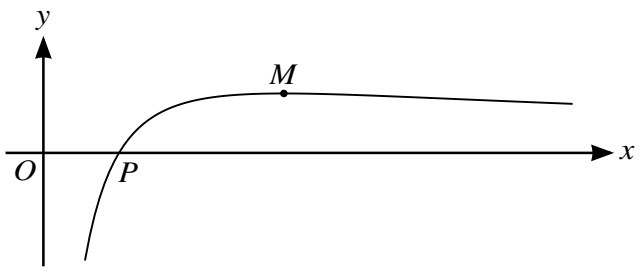
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3 Without using a calculator, find the exact value of $\int_0^2 4e^{-x}(e^{3x} + 1)\,dx$. [5]

4



The diagram shows the curve with equation $y = \dfrac{5\ln x}{2x+1}$. The curve crosses the x-axis at the point P and has a maximum point M.

(i) Find the gradient of the curve at the point P. [3]

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(ii) Show that the x-coordinate of the point M satisfies the equation $x = \dfrac{x + 0.5}{\ln x}$. [2]

(iii) Use an iterative formula based on the equation in part **(ii)** to find the x-coordinate of M correct to 4 significant figures. Show the result of each iteration to 6 significant figures. [3]

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[Turn over

5 The parametric equations of a curve are

$$x = 2\cos 2\theta + 3\sin\theta, \qquad y = 3\cos\theta$$

for $0 < \theta < \frac{1}{2}\pi$.

(i) Find the gradient of the curve at the point for which $\theta = 1$ radian. [4]

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(ii) Find the value of $\sin\theta$ at the point on the curve where the tangent is parallel to the y-axis. [3]

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6 The cubic polynomial $f(x)$ is defined by

$$f(x) = x^3 + ax^2 + 14x + a + 1,$$

where a is a constant. It is given that $(x + 2)$ is a factor of $f(x)$.

(i) Use the factor theorem to find the value of a and hence factorise $f(x)$ completely. [5]

(ii) Hence, without using a calculator, solve the equation $f(2x) = 3f(x)$. [4]

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7 **(i)** Express $5\cos\theta - 2\sin\theta$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$. Give the value of α correct to 4 decimal places. [3]

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(ii) Using your answer from part **(i)**, solve the equation

$$5\cot\theta - 4\operatorname{cosec}\theta = 2$$

for $0 < \theta < 2\pi$. [5]

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(iii) Find $\int \frac{1}{\left(5\cos\frac{1}{2}x - 2\sin\frac{1}{2}x\right)^2}\,\mathrm{d}x$. [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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