Cambridge International AS Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

9976757020

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **(P2)** **May/June 2019**

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 **12** printed pages.

Cambridge Assessment International Education

[Turn over

1 The polynomial $p(x)$ is defined by

$$p(x) = 4x^3 + (k+1)x^2 - mx + 3k,$$

where k and m are constants. Given that $(x+1)$ is a factor of $p(x)$, express m in terms of k. [3]

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

(ii) Hence solve the equation $|4 + 2e^{3y}| = |3 - 5e^{3y}|$, giving the answer correct to 3 significant figures. [2]

3 Find the exact coordinates of the stationary point of the curve with equation $y = \dfrac{3x}{\ln x}$. [5]

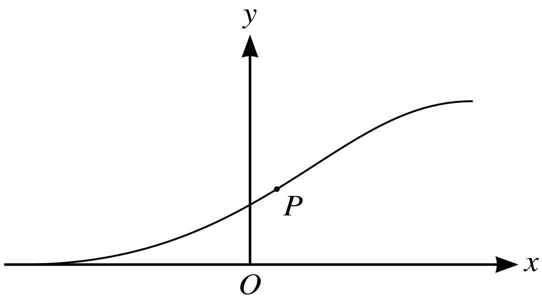
4 **(a)** Find the exact value of $\int_0^{\frac{1}{2}\pi} (4\sin 2x + 2\cos^2 x)\,\mathrm{d}x$. Show all necessary working. [5]

(b) Use the trapezium rule with two intervals to find an approximation to $\int_2^8 \sqrt{(\ln(1+x))}\,\mathrm{d}x$. [3]

5 **(i)** Find the quotient and remainder when $2x^3 + x^2 - 8x$ is divided by $(2x + 1)$. [3]

(ii) Hence find the exact value of $\int_0^3 \frac{2x^3 + x^2 - 8x}{2x + 1}\, dx$, giving the answer in the form $\ln(ke^a)$ where k and a are constants. [5]

6



The diagram shows the curve with parametric equations

$$x = 3t - 6e^{-2t}, \quad y = 4t^2e^{-t},$$

for $0 \leqslant t \leqslant 2$. At the point P on the curve, the y-coordinate is 1.

(i) Show that the value of t at the point P satisfies the equation $t = \frac{1}{2}e^{\frac{1}{2}t}$. [2]

....

....

....

....

....

....

....

(ii) Use the iterative formula $t_{n+1} = \frac{1}{2}e^{\frac{1}{2}t_n}$ with $t_1 = 0.7$ to find the value of t at P correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

....

....

....

....

....

....

....

....

(iii) Find the gradient of the curve at P, giving the answer correct to 2 significant figures. [5]

7 **(a)** **(i)** Express $4\sin\theta + 4\cos\theta$ in the form $R\sin(\theta + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. [3]

(ii) Hence find the smallest positive value of θ satisfying the equation $4\sin\theta + 4\cos\theta = 5$. [2]

(b) Solve the equation

$$4\cot 2x = 5 + \tan x$$

for $0 < x < \pi$, showing all necessary working and giving the answers correct to 2 decimal places. [6]

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.