GradeMax

Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

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2902617618

MATHEMATICS **9709/21**

Paper 2 Pure Mathematics 2 **(P2)** **October/November 2017**

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.
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 **11** printed pages and **1** blank page.

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1 Solve the equation $\ln(3x + 1) - \ln(x + 2) = 1$, giving your answer in terms of e. [4]

2 Solve the equation $5\cos\theta(1 + \cos 2\theta) = 4$ for $0° \leqslant \theta \leqslant 360°$. [5]

3 It is given that the variable x is such that

$$1.3^{2x} < 80 \qquad \text{and} \qquad |3x - 1| > |3x - 10|.$$

Find the set of possible values of x, giving your answer in the form $a < x < b$ where the constants a and b are correct to 3 significant figures. [7]

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4 **(a)** Find $\int \frac{4 + \sin^2\theta}{1 - \sin^2\theta} \, \mathrm{d}\theta$. [4]

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(b) Given that $\int_0^a \frac{2}{3x + 1} \, \mathrm{d}x = \ln 16$, find the value of the positive constant a. [4]

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

$$p(x) = ax^3 + bx^2 + 37x + 10$$

where a and b are constants. It is given that $(x + 2)$ is a factor of $p(x)$. It is also given that the remainder is 40 when $p(x)$ is divided by $(2x - 1)$.

(i) Find the values of a and b. [5]

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(ii) When a and b have these values, factorise $\mathrm{p}(x)$ completely. [3]

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6 The parametric equations of a curve are

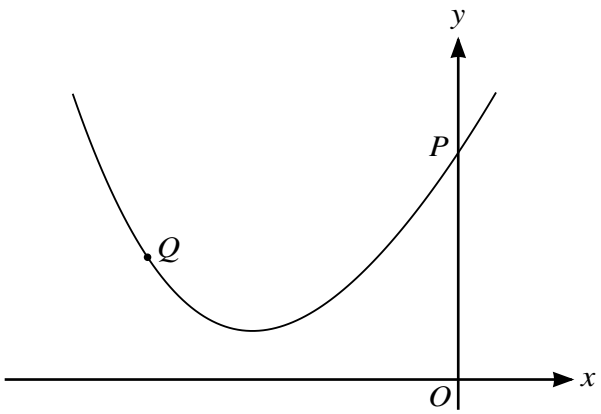
$$x = 2e^{2t} + 4e^{t}, \qquad y = 5te^{2t}.$$

(i) Find $\frac{dy}{dx}$ in terms of t and hence find the coordinates of the stationary point, giving each coordinate correct to 2 decimal places. [6]

(ii) Find the gradient of the normal to the curve at the point where the curve crosses the x-axis. [3]

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The diagram shows the curve

$$y = x^2 + 3x + 1 + 5\cos\tfrac{1}{2}x.$$

The curve crosses the y-axis at the point P and the gradient of the curve at P is m. The point Q on the curve has x-coordinate q and the gradient of the curve at Q is $-m$.

(i) Find the value of m and hence show that q satisfies the equation

$$x = a\sin\tfrac{1}{2}x + b,$$

where the values of the constants a and b are to be determined. [4]

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(ii) Show by calculation that $-4.5 < q < -4.0$. [2]

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

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