CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Advanced Subsidiary Level

MATHEMATICS 9709/2

PAPER 2 Pure Mathematics 2 **(P2)**

OCTOBER/NOVEMBER SESSION 2002

1 hour 15 minutes

Additional materials:
- Answer paper
- Graph paper
- List of Formulae (MF9)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

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.

INFORMATION FOR CANDIDATES

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.

Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

This question paper consists of 3 printed pages and 1 blank page.

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Local Examinations Syndicate

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

2 The cubic polynomial $2x^3 + ax^2 + b$ is denoted by $f(x)$. It is given that $(x + 1)$ is a factor of $f(x)$, and that when $f(x)$ is divided by $(x + 2)$ the remainder is -5. Find the values of a and b. [5]

3 **(i)** Express 9^x in terms of y, where $y = 3^x$. [1]

(ii) Hence solve the equation

$$2(9^x) - 7(3^x) + 3 = 0,$$

expressing your answers for x in terms of logarithms where appropriate. [5]

4 **(i)** By sketching a suitable pair of graphs, show that there is only one value of x in the interval $0 < x < \frac{1}{2}\pi$ that is a root of the equation

$$\sin x = \frac{1}{x^2}.$$ [2]

(ii) Verify by calculation that this root lies between 1 and 1.5. [2]

(iii) Show that this value of x is also a root of the equation

$$x = \sqrt{(\operatorname{cosec} x)}.$$ [1]

(iv) Use the iterative formula

$$x_{n+1} = \sqrt{(\operatorname{cosec} x_n)}$$

to determine this root correct to 3 significant figures, showing the value of each approximation that you calculate. [3]

5 The angle x, measured in degrees, satisfies the equation

$$\cos(x - 30°) = 3\sin(x - 60°).$$

(i) By expanding each side, show that the equation may be simplified to

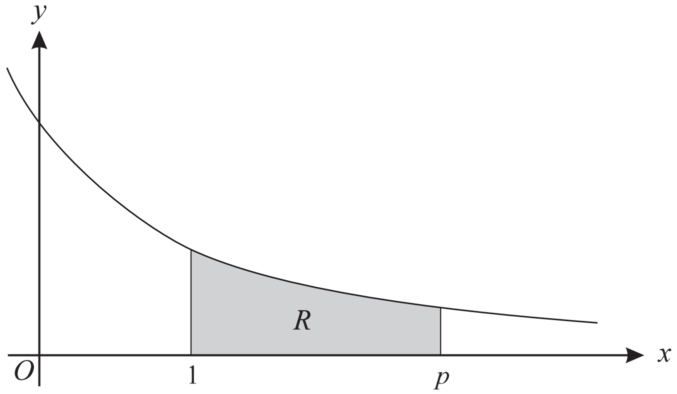
$$(2\sqrt{3})\cos x = \sin x.$$ [3]

(ii) Find the two possible values of x lying between 0° and 360°. [3]

(iii) Find the exact value of $\cos 2x$, giving your answer as a fraction. [3]

6 **(a)** Find the value of $\int_0^{\frac{1}{2}\pi} (\sin 2x + \cos x)\,dx$. [4]

(b)



The diagram shows part of the curve $y = \dfrac{1}{x+1}$. The shaded region R is bounded by the curve and by the lines $x = 1$, $y = 0$ and $x = p$.

(i) Find, in terms of p, the area of R. [3]

(ii) Hence find, correct to 1 decimal place, the value of p for which the area of R is equal to 2. [2]

7 The equation of a curve is

$$2x^2 + 3y^2 - 2xy = 10.$$

(i) Show that $\dfrac{dy}{dx} = \dfrac{y - 2x}{3y - x}$. [4]

(ii) Find the coordinates of the points on the curve where the tangent is parallel to the x-axis. [5]

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