UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International Level 3 Pre-U Certificate
Principal Subject

MATHEMATICS **9794/01**
Paper 1 Pure Mathematics 1 **For Examination from 2012**

ADDITIONAL PRACTICE PAPER **2 hours**

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF20)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 a 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 80.

1 Write down the coordinates of the centre and the radius of the circle with equation

$$(x+5)^2+(y-3)^2=36.$$ [2]

2 **(i)** Show that $x = 2$ is a root of the equation $2x^3-x^2-15x+18=0$. [1]

(ii) Hence solve the equation $2x^3-x^2-15x+18=0$. [4]

3 **(i)** In an arithmetic progression, the first term is 7 and the sum of the first 40 terms is 4960. Find the common difference. [4]

(ii) A geometric progression has first term 14 and common ratio 0.3. Find the sum to infinity. [2]

4 A sector AOB of a circle has radius r cm and the angle AOB is θ radians. The perimeter of the sector is 40 cm and its area is 100 cm^2.

(i) Write down equations for the perimeter and area of the sector in terms of r and θ. [2]

(ii) Use your equations to show that $r^2-20r+100=0$ and hence find the value of r and of θ. [5]

5 **(i)** Find $\int\left(\frac{1}{x-2}-\frac{2}{2x+3}\right)\mathrm{d}x$ giving your answer in its simplest form. [4]

(ii) Use integration by parts to find $\int x^2\ln x\,\mathrm{d}x$. [5]

6 **(i)** Find and simplify the first four terms in the expansion of $(1-2x)^9$ in ascending powers of x. [4]

(ii) In the expansion of

$$(2+ax)(1-2x)^9$$

the coefficient of x^2 is 66. Find the value of a. [3]

7 Given that the equation $x=2-\frac{1}{(x+1)^2}$ has a root between $x = 1$ and $x = 2$, use the Newton-Raphson formula with $x_0=2$ to find this root correct to 3 decimal places. [4]

8 A curve has equation $y = 2x^3 - 5x^2 - 4x + 1$.

(i) Find $\frac{dy}{dx}$. [2]

(ii) Hence find the x-coordinates of the stationary points of the curve. [2]

(iii) By using the second derivative, determine whether each of the stationary points is a maximum or a minimum. [3]

9 **(i)** On the same axes, sketch the curves $y = 3 + 2x - x^2$ and $y = x + 1$. [2]

(ii) Find the exact area of the region contained between the curves $y = 3 + 2x - x^2$ and $y = x + 1$. [8]

10 The points A and B have position vectors **a** and **b** relative to an origin O, where **a** = 5**i** + 4**j** – 2**k** and **b** = –7**i** +3**j** +**k**.

(i) Find the length of AB. [3]

(ii) Use a scalar product to find angle OAB. [3]

11 Solve the differential equation $x^2 \frac{dy}{dx} = \sec y$ given that $y = \frac{\pi}{6}$ when $x = 4$ giving your answer in the form $y = f(x)$. [6]

12 Calculate the maximum and minimum values of $\frac{1}{2 + \cos\theta + \sqrt{2}\sin\theta}$ and the smallest positive values of θ for which they occur. [11]

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