



**CAMBRIDGE 'A' LEVEL PROGRAMME
FIRST SEMESTER EXAMINATION JUNE 2006**
(March 2006 Intake)

Friday

9 June 2006

8.30 am – 10.30 am

FURTHER MATHEMATICS

9231

2 hours

Additional materials: Answer Booklet/Paper
List of formulae (MF 10)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your name and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
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.

Where a numerical value is necessary, take the acceleration due to gravity to be 10 ms^{-2} .

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 use of an electronic calculator is expected, where appropriate.

Results obtained solely from a graphic calculator, without supporting working or reasoning, will not receive credit.

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

This document consists of 3 printed pages.

Section A: Pure Mathematics 50%

1. Prove that $3^{4n-2} + 17^n + 22$ is divisible by 16 for every positive integer n . [8]

2. a) Express $\frac{2}{x(x+1)(x+2)}$ in partial fractions.

[6]

b) Using your result, prove that

$$\sum_{k=1}^n \frac{1}{k(k+1)(k+2)} = \frac{1}{4} - \frac{1}{2(n+1)(n+2)} \quad [7]$$

3. The roots of the equation $x^3 + 4x + 1 = 0$ are α, β, γ and $S_n = \alpha^n + \beta^n + \gamma^n$, where n is an integer.

i) Show that $S_2 = -8$. [3]

ii) Show that $S_{n+3} + 4S_{n+1} + S_n = 0$. [5]

iii) Find the value of S_4 . [5]

4. The curve C has equation

$$y = \frac{x^2 + 5}{x + 1}.$$

(i) Find the equations of the asymptotes of C . [2]

(ii) Find the stationary points of C and determine their type. [8]

(iii) Sketch the graph of C . [6]