TAYLOR'S UNIVERSITY COLLEGE
Wisdom • Integrity • Excellence

CAMBRIDGE A LEVEL PROGRAMME

SEMESTER ONE EXAMINATION DECEMBER 2008

(June 2008 Intake)

Thursday **4 December 2008** **1.00 pm – 3.00 pm**

FURTHER MATHEMATICS 9231/01

PAPER 1 **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.
The use of a 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.

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.

This document consists of **2** printed pages.

[Turn over

1 Given $\mathbf{A} = \begin{pmatrix} 5 & -1 \\ 4 & 1 \end{pmatrix}$, prove by induction that

$$\mathbf{A}^n = 3^{n-1}\begin{pmatrix} 2n+3 & -n \\ 4n & 3-2n \end{pmatrix}$$

for all positive integral values of n. [8]

2 The equation $x^3 - 17x^2 + 94x - 168 = 0$ has roots α, β and γ. Find the equation whose roots are $\alpha - 4, \beta - 4$ and $\gamma - 4$. Hence solve $x^3 - 17x^2 + 94x - 168 = 0$. [9]

3 Show that $\sum_{r=1}^{n} \frac{2}{(2r-1)(2r+1)} = \frac{2n}{2n+1}$ and use it to evaluate

$$\frac{1}{51\times 53} + \frac{1}{53\times 55} + \frac{1}{55\times 57} + \cdots + \frac{1}{199\times 201}$$ [10]

4 The curve C has equation $y = \frac{3x+2}{x+2}$.

(i) State all the asymptotes of C. [3]

(ii) Show that C does not have any stationary points. [3]

(iii) Sketch C, showing clearly the asymptotes and the coordinates of the points of intersection of C with the axes. [5]

5 Given the following system of linear equations

$$\begin{aligned} x - 3y + 2z &= 1 \\ x + ky + 2z &= 2 \\ -x + (k^2 - 1)y - kz &= 2k - 5 \end{aligned}$$

(i) Find the value of k for which the system has no solution. [3]

(ii) Find the value of k for which the system has infinitely many solutions and give these solutions in parametric form. [5]

(iii) Solve the system for the value of $k = -2$. [4]