7

TAYLOR'S COLLEGE

Wisdom • Integrity • Excellence

CAMBRIDGE 'A' LEVEL PROGRAMME

AS TRIAL EXAMINATION MARCH / APRIL 2005

(July 2004 Intake)

Wednesday **6 April 2005** **1.00 pm – 2.45 pm**

MATHEMATICS 9709/1

PAPER 1 Pure Mathematics 1 (P1) 1 hour 45 minutes

Additional materials: Answer Booklet/Paper
List of formulae (MF9)

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.
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 marks for this paper is 75.
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 document consists of 3 printed pages.

[Turn over

1. The points P, Q and R have coordinates $(3,-1)$, $(2,5)$ and $(6,3)$ respectively. Find the equation of the straight line joining P to the mid-point of QR. [4]

2. Express x^2+6x+3 in the form $(x+a)^2+b$. Hence,
   a) state the coordinates of the vertex of the graph of $y=x^2+6x+3$. [2]
   b) Solve the inequality $x^2+6x+3<0$, leaving your answer in exact form. [4]

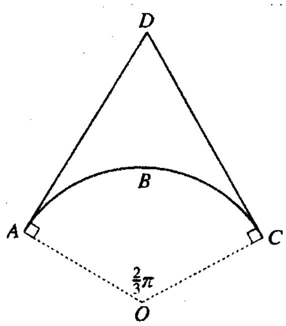
3. a) Find $\int\left(\frac{1}{x^2}-\frac{1}{\sqrt{x}}\right)dx$. [3]
   b) A curve passes through the point $(1,0)$ and is such that $\frac{dy}{dx}=\frac{1}{x^2}-\frac{1}{\sqrt{x}}$. Find the equation of the curve. [3]

4. Functions f and g are defined by

$$f: x \to 4x^2-1,\ x \in R,\ x \geq 0$$
$$g: x \to \sqrt{x+6},\ x \in R,\ x \geq m.$$

   a) State the range of f and sketch the graph of f. [2]
   b) Explain why the inverse function f^{-1} exists. [1]
   c) Find the smallest value of m for which the function g is valid. [2]
   d) Find an expression in the terms of x for fg. [2]

5.



In the diagram, ABC is an arc of a circle with centre O and radius 5cm. The lines AD and CD are tangents to the circle at A and C respectively. Angle $AOC=\frac{2}{3}\pi$ radians.

   a) Show that the exact length of AD is $5\sqrt{3}$ cm. [2]
   b) Find the area of the sector AOC, giving your answer in terms of π. [2]
   c) Calculate the area of the region enclosed by AD, DC and the arc ABC, giving your answer correct to 2 significant figures. [3]

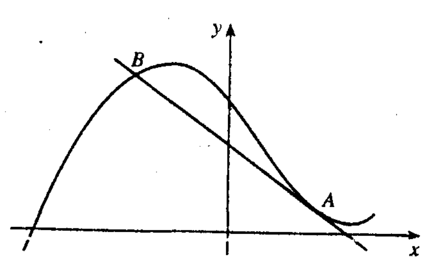
6. If the first four terms of the expansion of $(1+kx)^8$ in ascending powers of x are $1+12x+px^2+qx^3$,
   a) find k, p and q. [5]
   b) Using the values found in part a), find the coefficient of x^3 in the expansion of $(1-x)(1+kx)^8$. [3]

7. Relative to an origin O, points A and B have position vectors $\begin{pmatrix} 2 \\ -2 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 6 \\ -3 \\ 2 \end{pmatrix}$ respectively. Find the lengths of OA and OB. Hence or otherwise, find the exact area of the triangle AOB. [8]

8. a) Find all the solutions in the interval $0° < \theta < 180°$ of the equation $2\sin(3\theta - 48°) - 1 = 0$. [5]
   b) Show that $\sqrt{2\sin^2\theta + 6\cos^2\theta - 2} \equiv 2\cos\theta$. [3]

9. An arithmetic progression has first term a and common difference d.
   a) Write down an expression for the sixth term of the progression, in terms of a and d. [1]
   b) The first, second and sixth terms of this arithmetic progression are also the first three terms of a geometric progression. Prove that $d = 3a$. [3]
   c) Given that $a = 2$, find the sum of the first 15 terms of each progression. [6]

10.



The diagram shows the curve $y = 4x^3 - 4x^2 - 10x + 12$ and the tangent at point A where $x = 1$.
   a) Find the equation of this tangent. [5]
   b) Show that this tangent meets the curve again at point B where $x = -1$. [3]
   c) Calculate the area of the region which lies between the curve and the tangent AB. [3]