TAYLOR'S UNIVERSITY COLLEGE

Wisdom · Integrity · Excellence

CAMBRIDGE A LEVEL PROGRAMME

AS TRIAL EXAMINATION MARCH/APRIL 2008

(July 2007 Intake)

Monday **31 March 2008** **1.30 pm – 3.15 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.

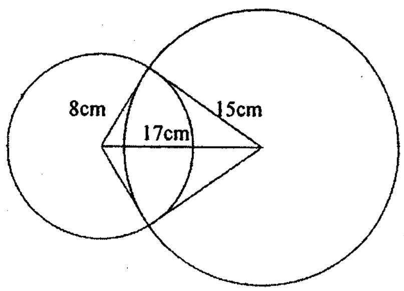
This document consists of **4** printed pages.

1. Show that the roots of the equation $\alpha x^2 + (\alpha+\beta)x + \beta = 0$ are real for all values of α and β. [3]

2. Solve the equation $3 \sin 2x + \cos 2x = 0$ for $0° \leq x \leq 180°$ [5]

3. (i) Find in ascending powers of x, the first 3 terms in the expansion of $(1-2x)^5$ and $(1+3x)^9$. [3]
   (ii) Hence, find the expansion of $(1-2x)^5(1+3x)^9$ up to the terms in x^2. [2]

4. Two circles of radii 8cm and 15cm are drawn, partly overlapping. Their centers are 17cm apart. Find the area common to the two circles. [7]

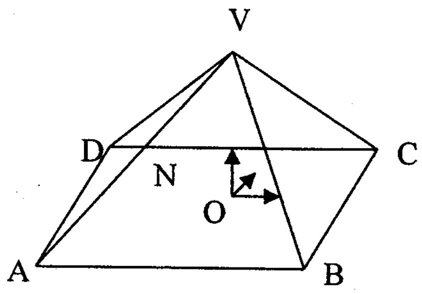


5. (a) The first three terms of an arithmetic progression are $z+4$, $2z+9$ and $6-z$. Find the value of z. [3]

   (b) Find the third term of a geometric progression that has a common ratio of $-\frac{1}{4}$ and a sum to infinity of 8. [4]

6. The point $P(1,2)$ lies on the curve for which $\frac{dy}{dx} = 2x - 4$. Find
   (i) the equation of the normal at P. [4]
   (ii) the equation of the curve. [4]

7. In the diagram, O is the centre of the square base ABCD of a right pyramid, vertex V. Unit vectors **i, j, k** are parallel to AB, AD and OV respectively. The length of AB is 4 units and the length of OV is $2h$ units ($h>0$). The point O is taken as the origin for position vectors.



(i) Write down the expression of the vector $\overrightarrow{VB}$. [2]

(ii) Given the position vector $\overrightarrow{OX}$ is $\frac{1}{2}\mathbf{i} - \frac{1}{2}\mathbf{j} + \frac{1}{2}h\mathbf{k}$, find the exact value of h if $\overrightarrow{OX}$ is perpendicular to $\overrightarrow{VB}$. [3]

(iii) Find the position vector of the midpoint N of $\overrightarrow{AV}$ if the length of OV is 2 units. [4]

8. The functions f and g are defined respectively by

$$f(x) = x^2 - 2x + 2$$

$$g(x) = \frac{1}{x} \quad , x \neq 0$$

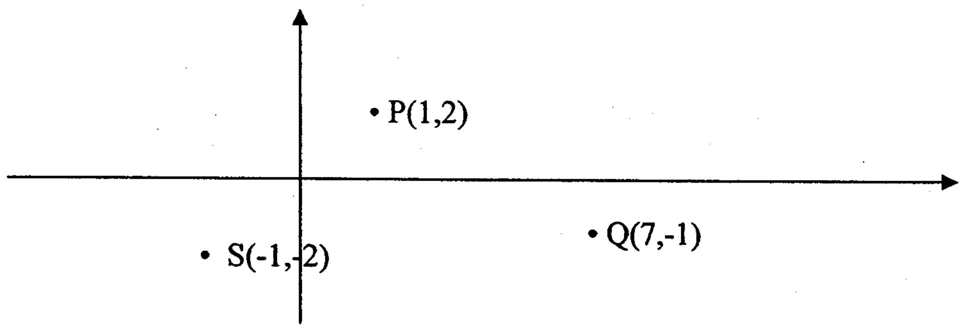
(i) Find the domain of function f so that its inverse function exists. [2]

(ii) Find the inverse of function f and state its domain. [4]

(iii) Find the range of the composite function $gf(x)$. [4]

[Turn over

9. (*Solution by drawing is not acceptable)*



PQRS is a parallelogram in which the coordinates of P, Q and S are (1,2), (7,-1) and (-1,-2) respectively.

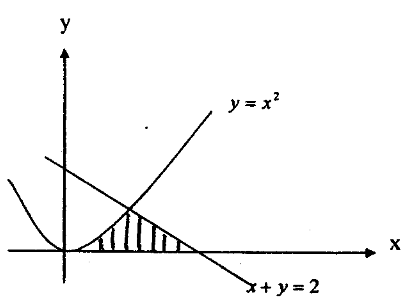
(i) Prove that the angle QPS is a right angle. [2]

(ii) Find the equation of the straight line parallel to PS and passes through Q. [2]

(iii) Find the equation of the straight line parallel to PQ and passes through S. Hence find the coordinates of R. [4]

(iv) Find the distance of RS. Leave your answer in surd form. [2]

10.



The diagram shows the shaded region enclosed by the curve $y = x^2$, the line $x + y = 2$ and the x-axis. Find

(i) the area of the shaded region. [6]

(ii) the volume of the solid formed when the shaded region is rotated through $360°$ about the x-axis. [5]