WELSH JOINT EDUCATION COMMITTEE **CYD-BWYLLGOR ADDYSG CYMRU**

General Certificate of Education **Tystysgrif Addysg Gyffredinol**

Advanced Level/Advanced Subsidiary **Safon Uwch/Uwch Gyfrannol**

MATHEMATICS C2

Pure Mathematics

Specimen Paper 2005/2006

($1\frac{1}{2}$ hours)

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

INFORMATION FOR CANDIDATES

A calculator may be used for this paper.

A formula booklet is available and may be used.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

1. Use the Trapezium Rule with five ordinates to find the value of the integral

$$\int_1^2 \frac{1}{1+x^3}\mathrm{d}x\,.$$

Show your working and give your answer correct to four decimal places. [4]

2. *(a)* Showing all your working, find all the values of θ between 0° and 360° satisfying

$$6\sin^2\theta + \cos\theta - 5 = 0.$$ [6]

(b) Find all the values of x in the interval $0° \le x \le 180°$ satisfying the equation

$$\tan 3x = -1.$$ [4]

3. The triangle ABC is such that $AB = 12$cm, $BC = 10$cm and $C\hat{A}B = 45°$

(a) Find, to the nearest degree, the two possible values of $B\hat{C}A$. [3]

(b) Find, correct to one decimal place, the possible values of the length AC. [5]

4. *(a)* A geometric series has first term a and common ratio r. Prove that the sum of the first n terms is given by

$$S_n = \frac{a(1-r^n)}{1-r}.$$

Given that $|r| < 1$, write down the sum to infinity of the series. [4]

(b) The sum to infinity of a geometric series is four times the first term of the series. Find the common ratio. [4]

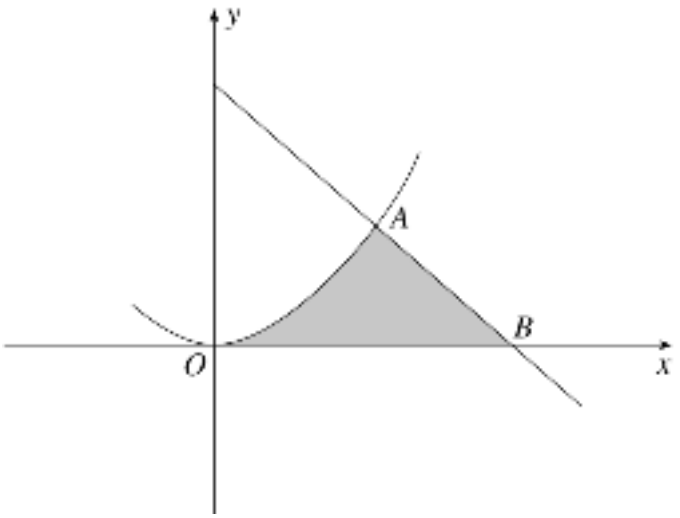
5. The fourth term of an arithmetic series is 11. The sixth term of the arithmetic series is 17.

(a) Find the common difference and the first term. [4]

(b) Find the sum of the first eight terms of the series. [1]

6. Integrate $\sqrt{x} - \frac{2}{x^2}$ with respect to x. [4]

7.



The diagram shows the curve $y = 2x^2$ and the line $y = 12 - 2x$ intersecting at the point A. The line $y = 12 - 2x$ intersects the x-axis at B.

(a) Find the coordinates of A and B. [5]

(b) Evaluate the area of the shaded region [7]

8.

The diagram shows a sector of a circle of centre O and radius 6·8cm. The perimeter of the sector is 23·12cm. Calculate the area, in cm^2, of the shaded region, giving you answer correct to two decimal places. [6]

9. *(a)* Given that $x = a^y$ where $a > 0$, write y in terms of x. Hence show that

$$\log_a x^n = n \log_a x.$$ [3]

(b) Solve the equation

$$2^{y+1} = 3,$$

giving your answer correct to three decimal places. [4]

10. A circle C has equation

$$(x - 5)^2 + (y - 7)^2 = 25.$$

(a) Write down the radius of the circle and the coordinates of its centre. [2]

(b) Find the equation of the tangent to the circle C at the point (2,3). [4]

(c) (i) Show that $Q(13,13)$ lies outside the circle C. [2]

(ii) Find the equation of a circle with centre at Q which touches the circle C externally. [3]