

WELSH JOINT EDUCATION COMMITTEE

CYD-BWYLLGOR ADDYSG CYMRU

General Certificate of Education

Tystysgrif Addysg Gyffredinol

Advanced Level/Advanced Subsidiary

Safon Uwch/Uwch Gyfrannol

MATHEMATICS C1

Pure Mathematics

Specimen Paper 2005/2006

(1 ½ hours)

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

Calculators are **not** allowed for this paper.

INFORMATION FOR CANDIDATES

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. The points A , B , C have coordinates $(4, -2)$, $(-12, 10)$, $(10, 6)$, respectively.

(a) Find the gradients of the lines AB , BC , CA . [3]

(b) Show that one of the angles of triangle ABC is a right-angle. [2]

(c) Show that the equation of the line AB is $3x + 4y - 4 = 0$. [2]

(d) The mid-point of BC is D . Find the length of AD . [4]

2. Simplify

$$\frac{2\sqrt{5} + \sqrt{2}}{\sqrt{5} - \sqrt{2}}$$

expressing your answer in the form $a + \sqrt{b}$, where a and b are integers. [4]

3. Use an algebraic method to solve the simultaneous equations

$$\begin{aligned}y &= x^2 - 3x + 2, \\y &= 3x - 7.\end{aligned}$$

Interpret your answer geometrically. [6]

4. Given that the equation

$$2kx^2 + 4x + k - 1 = 0$$

has two distinct real roots, show that

$$k^2 - k - 2 < 0.$$

Find the range of values of k satisfying this inequality. [6]

5. (a) Express $2x^2 - 12x + 25$ in the form $a(x - b)^2 + c$, where a , b , c are constants to be determined. [3]

(b) Find the least value of $2x^2 - 12x + 25$ and the corresponding value of x . [2]

(c) Sketch the curve $y = 2x^2 - 12x + 25$. [2]

6. (a) Given that $x + 2$ is a factor of
- $$kx^3 + 8x^2 + 3x - 2,$$
- show that $k = 3$. [3]

(b) Solve the equation

$$3x^3 + 8x^2 + 3x - 2 = 0. \quad [4]$$

- (c) Find the remainder when $3x^3 + 8x^2 + 3x - 2$ is divided by $x - 3$. [2]

7. (a) Using the binomial theorem, expand $(2x + 3)^4$, simplifying each term of the expansion. [4]

- (b) In the binomial expansion of $(1 + 3x)^n$ the coefficient of x^2 is 54. Given that $n > 0$, find the value of n . [4]

8. (a) Given that $y = x^2 - 4x + 2$, find $\frac{dy}{dx}$ from first principles. [5]

- (b) Differentiate $\frac{3}{x^4} + 4\sqrt{x}$ with respect to x . [4]

9. The curve C has equation

$$y = x^4 + x + 1.$$

- Find the equation of the tangent to C at the point $(1, 3)$. [4]

10. The curve C has equation

$$y = x^3 - 3x^2 - 9x + 3.$$

- (a) Find the coordinates and nature of the stationary points of C . [8]

- (b) Sketch C . [3]