WELSH JOINT EDUCATION COMMITTEE
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MATHEMATICS C1

Pure Mathematics

P.M. MONDAY, 10 January 2005

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

NEW SPECIFICATION

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a 12 page answer book;
- a Formula Booklet.

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

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

INFORMATION FOR CANDIDATES

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 and B have coordinates (2, 3) and (5, 9) respectively. The line through B perpendicular to AB meets the x-axis at the point C.

(a) Show that the equation of the line BC is

$$x + 2y - 23 = 0.$$ [6]

(b) Find the coordinates of C. [1]

The point D has coordinates (24, 1). The line through A parallel to the line CD intersects the line BC in the point E.

(c) Show that the coordinates of E are (7, 8). [5]

(d) Find the length of CE. [2]

2. Simplify

$$\frac{6 + \sqrt{7}}{\sqrt{7} - 2},$$

expressing your answer in surd form. [4]

3. A curve C has equation

$$y = 2x^3 - 6x^2 + 12.$$

(a) Find the coordinates of the stationary points of C and determine the nature of each of those points. [7]

(b) Sketch C. [3]

(c) State, giving a reason, the number of real roots of the equation

$$2x^3 - 6x^2 + 12 = 0.$$ [2]

4. *(a)* Find all the factors of the polynomial

$$3x^3 + 2x^2 - 19x + 6.$$ [6]

(b) Find the remainder when $3x^3 + 2x^2 - 19x + 6$ is divided by $x + 1$. [3]

5. Express the quadratic expression $x^2 - 14x + 55$ in the form $(x - a)^2 + b$, where the values of the constants a and b are to be determined. Hence show that $x^2 - 14x + 55$ is positive for all values of x. [5]

6. The curve C has equation

$$y = 4x^2 - 7x + 11,$$

and the line L has equation

$$y = 5x + k,$$

where k is a constant. Given that L intersects C in two distinct points, show that $k > 2$. [6]

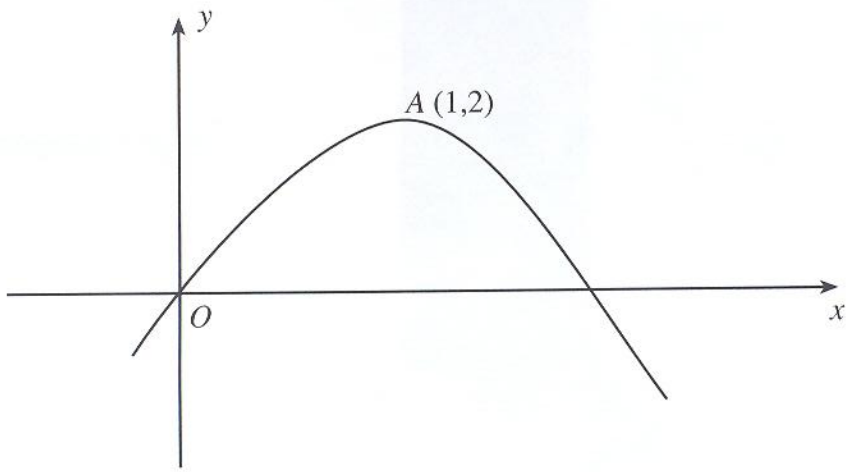
7. Differentiate $x^2 + 4x + 3$ from first principles. [5]

8. The curve C has equation $y = 3x^{\frac{3}{2}} - \frac{32}{x}$.

(a) Find the equation of the tangent to C at the point where $x = 4$. [7]

(b) Find the equation of the normal to C at the point where $x = 4$. [2]

9.



The diagram shows the graph of $y = f(x)$. The curve passes through the origin, and has a maximum point at (1, 2).
Sketch on separate diagrams the graphs of

(a) $y = f(x) + 4$, *(b)* $y = f(x + 3)$, *(c)* $y = f(2x)$,

giving the coordinates of the maximum point in each case. [2], [2], [2]

10. *(a)* Write down the expansion of $(a + b)^4$. [2]

(b) In the binomial expansion of $(a + 2x)^4$, the coefficient of the term in x^2 is twelve times the coefficient of the term in x^3. Find the value of a. [3]