



GCE AS/A Level – **LEGACY**

0973/01



MATHEMATICS – C1
Pure Mathematics

WEDNESDAY, 16 MAY 2018 – MORNING

1 hour 30 minutes

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a WJEC pink 16-page answer booklet;
- a Formula Booklet.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

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 , B , C and D have coordinates $(-2, 7)$, $(2, -1)$, $(5, 3)$ and $(3, 7)$ respectively.
- (a) (i) Show that AB and DC are parallel.
(ii) Find the equation of AB . [5]
- (b) The line L has equation $x - 2y + 11 = 0$ and intersects AB at the point E .
- (i) Giving a reason, determine whether or not L is perpendicular to AB .
(ii) Show that E has coordinates $(-1, 5)$.
(iii) Calculate the length of EF , where F denotes the midpoint of AB . [8]
- (c) **Write down** the geometrical name for the quadrilateral $ABCD$. [1]
2. Simplify $\sqrt{500} + (\sqrt{12} \times \sqrt{15}) - \frac{7\sqrt{60}}{\sqrt{3}}$. [4]
3. The curve C has equation $y = x^2 - 6x + 7$. The point P , whose x -coordinate is 2, lies on C .
- (a) Show that the equation of the **normal** to C at P is $y = \frac{1}{2}x - 2$. [6]
(b) The normal to C at P intersects C again at the point Q . Find the coordinates of Q . [4]
4. (a) Express $4x^2 + 40x - 69$ in the form $a(x + b)^2 + c$, where the values of the constants a , b and c are to be found. [3]
(b) **Using your answer to part (a)**, solve the equation
- $$4x^2 + 40x - 69 = 0. \quad [3]$$
5. (a) Using the binomial theorem, write down and simplify the first four terms in the expansion of $\left(1 - \frac{x}{2}\right)^7$ in ascending powers of x . [4]
(b) The coefficient of x^2 in the expansion of $(1 + 4x)^n$ is 3360. Given that n is a positive integer, find the value of n . [3]
6. Find the range of values of x satisfying the inequality
- $$9x^2 + 16x - 4 > 0. \quad [3]$$

7. (a) Given that $y = 9x^2 - 7x - 8$, find $\frac{dy}{dx}$ from first principles. [5]

(b) Given that $y = \frac{k}{x} + 14\sqrt{x}$ and that $\frac{dy}{dx} = 2$ when $x = 9$, find the value of the constant k . [4]

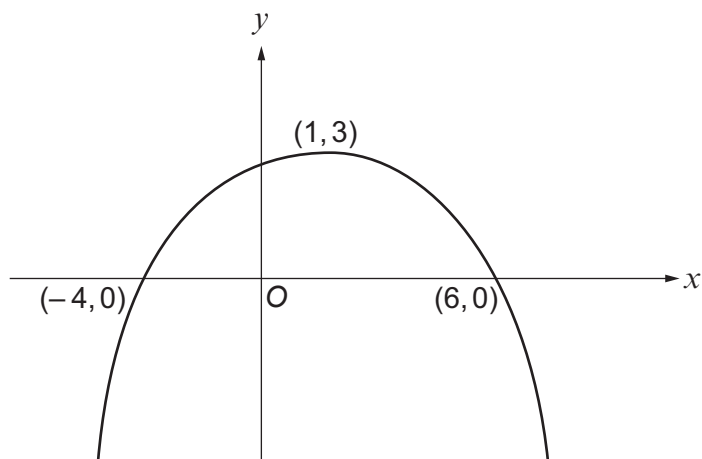
8. (a) (i) Find one real root of the equation $8x^3 + 7x^2 - 13x + 10 = 0$.

(ii) Show that the root you have found is the only real root of the equation

$$8x^3 + 7x^2 - 13x + 10 = 0. \quad [7]$$

(b) When $x^3 - 80$ is divided by $x - a$, the remainder is 45. Find the value of the constant a . [2]

9. The diagram shows a sketch of the graph of $y = f(x)$. The graph passes through the points $(-4, 0)$ and $(6, 0)$ and has a maximum point at $(1, 3)$.

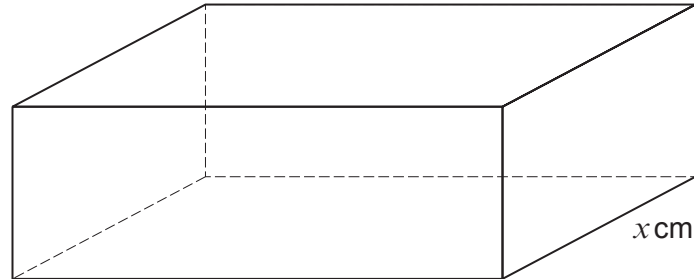


(a) Sketch the graph of $y = f(x + 3)$, indicating the coordinates of the stationary point and the coordinates of the points of intersection of the graph with the x -axis. [3]

(b) Gwen is asked by her teacher to draw the graph of $y = f(ax)$ for various values of the constant a . Two of Gwen's graphs pass through the point $(2, 0)$. Find the value of a corresponding to each of these two graphs. [2]

TURN OVER

10. A closed box, in the form of a cuboid, is such that the length of its base is three times the width of its base. The volume of the box is 6000cm^3 . The total length of the twelve edges of the box is denoted by L cm.



- (a) Show that $L = 16x + \frac{8000}{x^2}$, where x cm denotes the width of the base. [3]
- (b) Find the minimum value of L , showing that the value you have found is a minimum value. [5]

END OF PAPER