FOR OCR

GCE Examinations

Advanced / Advanced Subsidiary

Core Mathematics C1

Sample Paper from Solomon Press

Time: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures, unless a different degree of accuracy is specified in the question or is clearly appropriate.
- **You are not permitted to use a calculator in this paper.**

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 72.
- **You are reminded of the need for clear presentation in your answers.**

Written by Shaun Armstrong

1. *(i)* Calculate the discriminant of $2x^2 + 3x - 1$. [2]

(ii) State, with a reason, the number of real roots of the equation

$$2x^2 + 3x - 1 = 0.$$ [2]

2. Find the set of values of x for which

$$2x^2 - 11x + 12 < 0.$$ [4]

3. *(i)* Express $(6\tfrac{1}{4})^{-\frac{1}{2}}$ as an exact fraction in its simplest form. [2]

(ii) Find the value of x such that

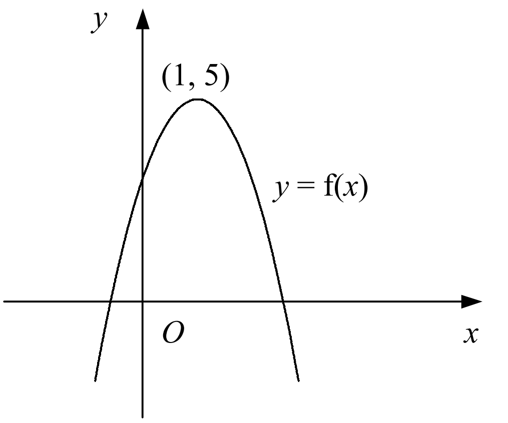
$$2^{x+1} = 4\sqrt{2}\,.$$ [3]

4. Solve the simultaneous equations

$$2x - y + 9 = 0$$

$$x^2 + 2xy + y^2 = 9$$ [7]

5.



The diagram shows the curve with equation $y = \mathrm{f}(x)$ which has a turning point at (1, 5).

(a) Showing the coordinates of the turning point in each case, sketch the curve with equation

(i) $y = \mathrm{f}(x + 3)$,

(ii) $y = \mathrm{f}(2x)$. [4]

(b) Given also that

$$\mathrm{f}(x) = ax^2 + bx + 3,$$

find the values of the constants a and b. [4]

6. The curve with equation

$$y = x + \frac{8}{x} + 3, \quad x > 0,$$

has a stationary point at A.

(i) Find the x-coordinate of A, giving your answer in the form $k\sqrt{2}$. [5]

(ii) Find the exact y-coordinate of A in its simplest form. [2]

(iii) Determine whether the stationary point is a maximum point or a minimum point. [3]

Turn over

7. The straight line l_1 passes through the points A $(-2, 2)$ and B $(1, 3)$.

(i) Find an equation for l_1, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [4]

The straight line l_2 is perpendicular to l_1 and passes through the point C $(9, -1)$.

(ii) Find an equation for l_2. [2]

Given that l_1 and l_2 intersect at the point D,

(iii) show that the ratio of the length of AB to the length of AD is $1 : 3$ [5]

8. The curve C has the equation $y = x^3 - 4x^2 + x + 6$.

(i) Show that $(x + 1)(x - 2)(x - 3) \equiv x^3 - 4x^2 + x + 6$. [2]

(ii) Sketch the curve C, showing the coordinates of any points of intersection with the coordinate axes. [3]

The point P on C has x-coordinate 1.

(iii) Find an equation of the tangent to C at P. [6]

9. The points P $(-8, 3)$, Q $(4, 7)$ and R $(6, 1)$ all lie on circle C.

(i) Show that $\angle PQR = 90°$. [3]

(ii) Hence, find the coordinates of the centre of C. [2]

(iii) Show that C has the equation

$$x^2 + y^2 + 2x - 4y - 45 = 0.$$ [3]

(iv) Find, in the form $y = mx + c$, the equation of the tangent to C at Q. [4]