FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper A

Time: 1 hour 30 minutes

Instructions and Information

Candidates may NOT use a calculator in this paper

Full marks may be obtained for answers to ALL questions.

Mathematical formulae and statistical tables are available.

This paper has ten questions.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner. Answers without working may gain no credit.

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1. *(a)* Express $\frac{21}{\sqrt{7}}$ in the form $k\sqrt{7}$. **(2)**

(b) Express $8^{-\frac{1}{3}}$ as an exact fraction in its simplest form. **(2)**

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2. Evaluate

$$\sum_{r=10}^{30} (7 + 2r).$$ **(4)**

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3. Differentiate with respect to x

$$\frac{6x^2 - 1}{2\sqrt{x}}.$$ **(5)**

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4. *(a)* Solve the inequality

$$x^2 + 3x > 10.$$ **(3)**

(b) Find the set of values of x which satisfy both of the following inequalities:

$$3x - 2 < x + 3$$

$$x^2 + 3x > 10$$ **(3)**

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5. The sequence $u_1, u_2, u_3, \ldots$ is defined by the recurrence relation

$$u_{n+1} = (u_n)^2 - 1, \quad n \geq 1.$$

Given that $u_1 = k$, where k is a constant,

(a) find expressions for u_2 and u_3 in terms of k. **(3)**

Given also that $u_2 + u_3 = 11$,

(b) find the possible values of k. **(4)**

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6. *(a)* By completing the square, find in terms of the constant k the roots of the equation

$$x^2 + 4kx - k = 0.$$ **(4)**

(b) Hence find the set of values of k for which the equation has no real roots. **(4)**

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7. *(a)* Describe fully a single transformation that maps the graph of $y = \frac{1}{x}$ onto the graph of $y = \frac{3}{x}$. **(2)**

(b) Sketch the graph of $y = \frac{3}{x}$ and write down the equations of any asymptotes. **(3)**

(c) Find the values of the constant c for which the straight line $y = c - 3x$ is a tangent to the curve $y = \frac{3}{x}$. **(4)**

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8. The points P and Q have coordinates $(7, 4)$ and $(9, 7)$ respectively.

(a) Find an equation for the straight line l which passes through P and Q. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

The straight line m has gradient 8 and passes through the origin, O.

(b) Write down an equation for m. **(1)**

The lines l and m intersect at the point R.

(c) Show that $OP = OR$. **(5)**

Turn over

9.

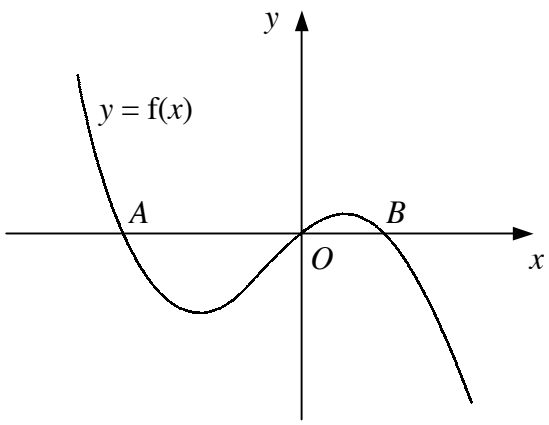

Figure 1

Figure 1 shows the curve with equation $y = \mathrm{f}(x)$ which crosses the x-axis at the origin and at the points A and B.

Given that

$$\mathrm{f}'(x) = 6 - 4x - 3x^2,$$

(a) find an expression for y in terms of x, **(5)**

(b) show that $AB = k\sqrt{7}$, where k is an integer to be found. **(6)**

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10. A curve has the equation $y = x + \dfrac{3}{x}$, $x \neq 0$.

The point P on the curve has x-coordinate 1.

(a) Show that the gradient of the curve at P is -2. **(3)**

(b) Find an equation for the normal to the curve at P, giving your answer in the form $y = mx + c$. **(4)**

(c) Find the coordinates of the point where the normal to the curve at P intersects the curve again. **(4)**

END