FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C1

Paper F

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.

Written by Shaun Armstrong

1. Find in exact form the real solutions of the equation

$$x^4 = 5x^2 + 14.$$ **(3)**

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2. Express

$$\frac{2}{3\sqrt{5}+7}$$

in the form $a + b\sqrt{5}$ where a and b are rational. **(3)**

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3. *(a)* Solve the equation

$$x^{\frac{3}{2}} = 27.$$ **(2)**

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

4.

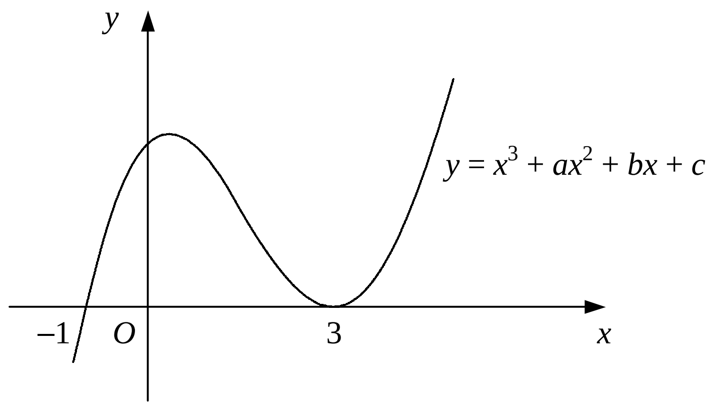

Figure 1

Figure 1 shows the curve with equation $y = x^3 + ax^2 + bx + c$, where a, b and c are constants. The curve crosses the x-axis at the point $(-1, 0)$ and touches the x-axis at the point $(3, 0)$.

Show that $a = -5$ and find the values of b and c. **(5)**

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5. Given that

$$y = \frac{x^4 - 3}{2x^2},$$

(a) find $\frac{dy}{dx}$, **(4)**

(b) show that $\frac{d^2y}{dx^2} = \frac{x^4 - 9}{x^4}$. **(2)**

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6. *(a)* Sketch on the same diagram the curve with equation $y = (x - 2)^2$ and the straight line with equation $y = 2x - 1$.

Label on your sketch the coordinates of any points where each graph meets the coordinate axes. **(5)**

(b) Find the set of values of x for which

$$(x - 2)^2 > 2x - 1.$$ **(3)**

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7. A curve has the equation $y = \frac{x}{2} + 3 - \frac{1}{x}$, $x \neq 0$.

The point A on the curve has x-coordinate 2.

(a) Find the gradient of the curve at A. **(4)**

(b) Show that the tangent to the curve at A has equation

$$3x - 4y + 8 = 0.$$ **(3)**

The tangent to the curve at the point B is parallel to the tangent at A.

(c) Find the coordinates of B. **(3)**

Turn over

8. The straight line l_1 has gradient $\frac{3}{2}$ and passes through the point A (5, 3).

(a) Find an equation for l_1 in the form $y = mx + c$. **(2)**

The straight line l_2 has the equation $3x - 4y + 3 = 0$ and intersects l_1 at the point B.

(b) Find the coordinates of B. **(3)**

(c) Find the coordinates of the mid-point of AB. **(2)**

(d) Show that the straight line parallel to l_2 which passes through the mid-point of AB also passes through the origin. **(4)**

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9. The third term of an arithmetic series is $5\frac{1}{2}$.

The sum of the first four terms of the series is $22\frac{3}{4}$.

(a) Show that the first term of the series is $6\frac{1}{4}$ and find the common difference. **(7)**

(b) Find the number of positive terms in the series. **(3)**

(c) Hence, find the greatest value of the sum of the first n terms of the series. **(2)**

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10. The curve C has the equation $y = \mathrm{f}(x)$.

Given that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 8x - \frac{2}{x^3}, \quad x \neq 0,$$

and that the point P (1, 1) lies on C,

(a) find an equation for the tangent to C at P in the form $y = mx + c$, **(3)**

(b) find an equation for C, **(5)**

(c) find the x-coordinates of the points where C meets the x-axis, giving your answers in the form $k\sqrt{2}$. **(5)**

END