FOR EDEXCEL

GCE Examinations
Advanced Subsidiary

Core Mathematics C1

Paper E

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. *(a)* Express $\dfrac{18}{\sqrt{3}}$ in the form $k\sqrt{3}$. **(2)**

(b) Express $(1 - \sqrt{3})(4 - 2\sqrt{3})$ in the form $a + b\sqrt{3}$ where a and b are integers. **(2)**

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2. Solve the equation

$$3x - \frac{5}{x} = 2.$$ **(4)**

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3. The straight line l has the equation $x - 5y = 7$.

The straight line m is perpendicular to l and passes through the point $(-4, 1)$.

Find an equation for m in the form $y = mx + c$. **(5)**

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4. A sequence of terms is defined by

$$u_n = 3^n - 2, \quad n \geq 1.$$

(a) Write down the first four terms of the sequence. **(2)**

The same sequence can also be defined by the recurrence relation

$$u_{n+1} = au_n + b, \quad n \geq 1, \quad u_1 = 1,$$

where a and b are constants.

(b) Find the values of a and b. **(4)**

5.

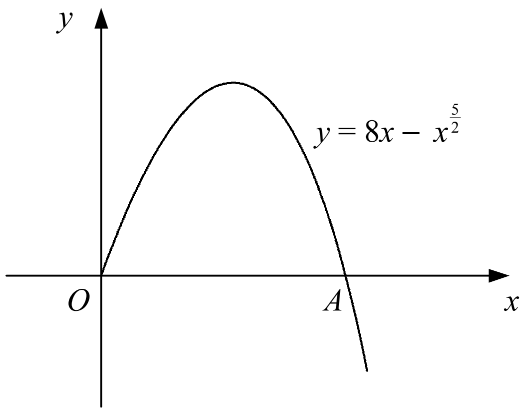

Figure 1

Figure 1 shows the curve with equation $y = 8x - x^{\frac{5}{2}}$, $x \geq 0$.

The curve meets the x-axis at the origin, O, and at the point A.

(a) Find the x-coordinate of A. **(3)**

(b) Find the gradient of the tangent to the curve at A. **(4)**

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6. $$\mathrm{f}(x) = 2x^2 - 4x + 1.$$

(a) Find the values of the constants a, b and c such that

$$\mathrm{f}(x) = a(x + b)^2 + c.$$ **(4)**

(b) State the equation of the line of symmetry of the curve $y = \mathrm{f}(x)$. **(1)**

(c) Solve the equation $\mathrm{f}(x) = 3$, giving your answers in exact form. **(3)**

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7. $$\mathrm{f}(x) \equiv \frac{(x-4)^2}{2x^{\frac{1}{2}}}, \quad x > 0.$$

(a) Find the values of the constants A, B and C such that

$$\mathrm{f}(x) = Ax^{\frac{3}{2}} + Bx^{\frac{1}{2}} + Cx^{-\frac{1}{2}}.$$ **(3)**

(b) Show that

$$\mathrm{f}'(x) = \frac{(3x+4)(x-4)}{4x^{\frac{3}{2}}}.$$ **(6)**

Turn over

8. *(a)* Describe fully the single transformation that maps the graph of $y = \mathrm{f}(x)$ onto the graph of $y = \mathrm{f}(x - 1)$. **(2)**

(b) Showing the coordinates of any points of intersection with the coordinate axes and the equations of any asymptotes, sketch the graph of $y = \dfrac{1}{x-1}$. **(3)**

(c) Find the x-coordinates of any points where the graph of $y = \dfrac{1}{x-1}$ intersects the graph of $y = 2 + \dfrac{1}{x}$. Give your answers in the form $a + b\sqrt{3}$, where a and b are rational. **(5)**

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9. A store begins to stock a new range of DVD players and achieves sales of £1500 of these products during the first month.

In a model it is assumed that sales will decrease by £x in each subsequent month, so that sales of £$(1500 - x)$ and £$(1500 - 2x)$ will be achieved in the second and third months respectively.

Given that sales total £8100 during the first six months, use the model to

(a) find the value of x, **(4)**

(b) find the expected value of sales in the eighth month, **(2)**

(c) show that the expected total of sales in pounds during the first n months is given by $kn(51 - n)$, where k is an integer to be found. **(3)**

(d) Explain why this model cannot be valid over a long period of time. **(1)**

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10. The curve C with equation $y = \mathrm{f}(x)$ is such that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 3x^2 + 4x + k,$$

where k is a constant.

Given that C passes through the points $(0, -2)$ and $(2, 18)$,

(a) show that $k = 2$ and find an equation for C, **(7)**

(b) show that the line with equation $y = x - 2$ is a tangent to C and find the coordinates of the point of contact. **(5)**

END