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# 6663/01

# Edexcel GCE

## Core Mathematics C1

**Advanced Subsidiary**

Monday 2 June 2008 – Morning

Time: 1 hour 30 minutes

**Materials required for examination**
Mathematical Formulae (Green)

**Items included with question papers**
Nil

**Calculators may NOT be used in this examination.**

## Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions.
You must write your answer for each question in the space following the question.

## Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.
There are 28 pages in this question paper. Any blank pages are indicated.

## Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You should show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

H 2 9 9 9 2 A 0 1 2 8

*Turn over*

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1.  Find $\int (2 + 5x^2)\, dx$.

(3)

(Total 3 marks)

**2.** Factorise completely

$$x^3 - 9x.$$
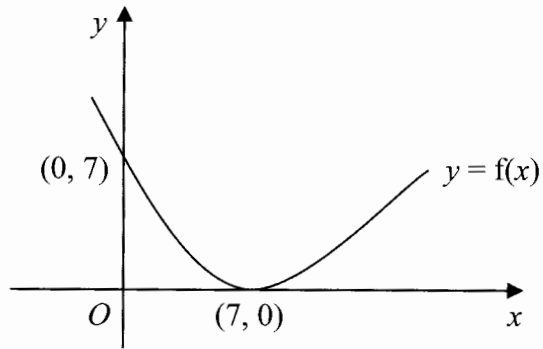
(3)

(Total 3 marks)

**Turn over**

3.



**Figure 1**

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the point $(0, 7)$ and has a minimum point at $(7, 0)$.

On separate diagrams, sketch the curve with equation

(a) $y = f(x) + 3$,

**(3)**

(b) $y = f(2x)$.

**(2)**

On each diagram, show clearly the coordinates of the minimum point and the coordinates of the point at which the curve crosses the $y$-axis.

**Question 3 continued**

**(Total 5 marks)**

**Turn over**

**4.** $$f(x) = 3x + x^3, \qquad x > 0.$$

(a) Differentiate to find $f'(x)$.

**(2)**

Given that $f'(x) = 15$,

(b) find the value of $x$.

**(3)**

**Question 4 continued**

(Total 5 marks)

**5.** A sequence $x_1, x_2, x_3, \ldots$ is defined by

$$x_1 = 1,$$

$$x_{n+1} = ax_n - 3, \quad n \geqslant 1,$$

where $a$ is a constant.

(a) Find an expression for $x_2$ in terms of $a$.

**(1)**

(b) Show that $x_3 = a^2 - 3a - 3$.

**(2)**

Given that $x_3 = 7$,

(c) find the possible values of $a$.

**(3)**

**Question 5 continued**

**(Total 6 marks)**

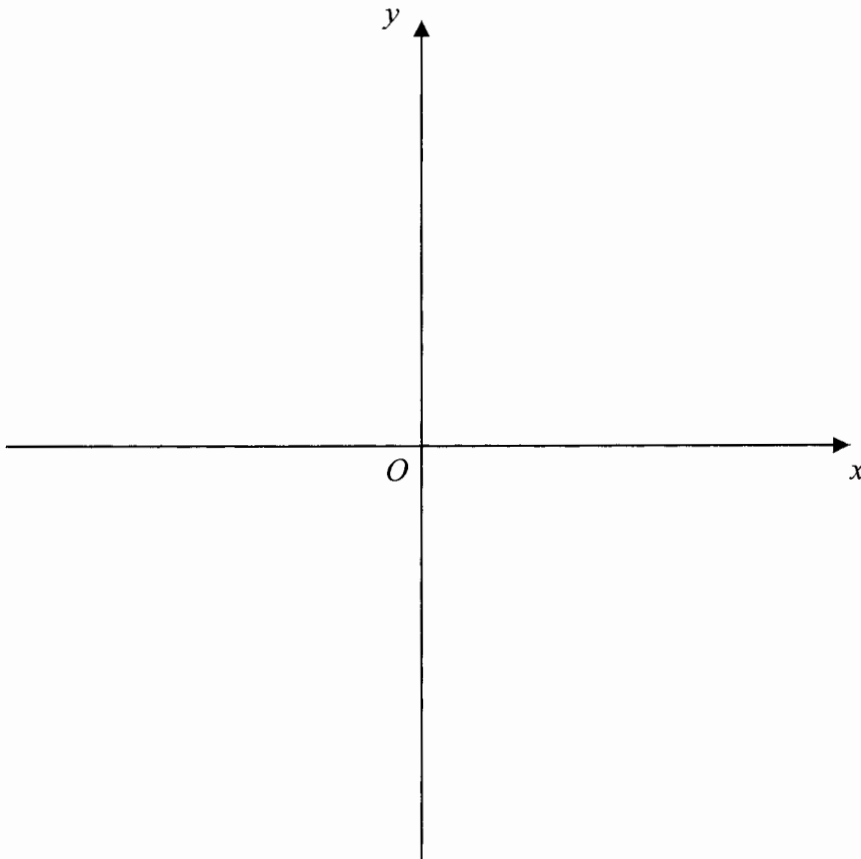**6.** The curve $C$ has equation $y = \dfrac{3}{x}$ and the line $l$ has equation $y = 2x + 5$.

    (a) On the axes below, sketch the graphs of $C$ and $l$, indicating clearly the coordinates of any intersections with the axes.

         **(3)**

    (b) Find the coordinates of the points of intersection of $C$ and $l$.

         **(6)**

**Question 6 continued**

(Total 9 marks)

Q6

**7.** Sue is training for a marathon. Her training includes a run every Saturday starting with a run of 5 km on the first Saturday. Each Saturday she increases the length of her run from the previous Saturday by 2 km.

(a) Show that on the 4th Saturday of training she runs 11 km.

**(1)**

(b) Find an expression, in terms of $n$, for the length of her training run on the $n$th Saturday.

**(2)**

(c) Show that the total distance she runs on Saturdays in $n$ weeks of training is $n(n + 4)$ km.

**(3)**

On the $n$th Saturday Sue runs 43 km.

(d) Find the value of $n$.

**(2)**

(e) Find the total distance, in km, Sue runs on Saturdays in $n$ weeks of training.

**(2)**

**Question 7 continued**

**Question 7 continued**

**Question 7 continued**

(Total 10 marks)

**8.** Given that the equation $2qx^2 + qx - 1 = 0$, where $q$ is a constant, has no real roots,

(a) show that $q^2 + 8q < 0$.

**(2)**

(b) Hence find the set of possible values of $q$.

**(3)**

**Question 8 continued**

(Total 5 marks)

H 2 9 9 9 2 A 0 1 7 2 8

**9.** The curve $C$ has equation $y = kx^3 - x^2 + x - 5$, where $k$ is a constant.

(a) Find $\dfrac{dy}{dx}$ .

**(2)**

The point $A$ with $x$-coordinate $-\frac{1}{2}$ lies on $C$. The tangent to $C$ at $A$ is parallel to the line with equation $2y - 7x + 1 = 0$.

Find

(b) the value of $k$,

**(4)**

(c) the value of the $y$-coordinate of $A$.

**(2)**

**Question 9 continued**

**Question 9 continued**

**Question 9 continued**

(Total 8 marks)

**10.**



**Figure 2**

The points $Q$ (1, 3) and $R$ (7, 0) lie on the line $l_1$, as shown in Figure 2.

The length of $QR$ is $a\sqrt{5}$.

(a)  Find the value of $a$.

(3)

The line $l_2$ is perpendicular to $l_1$, passes through $Q$ and crosses the $y$-axis at the point $P$, as shown in Figure 2.

Find

(b)  an equation for $l_2$,

(5)

(c)  the coordinates of $P$,

(1)

(d)  the area of $\Delta PQR$.

(4)

**Question 10 continued**

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**Question 10 continued**

**Question 10 continued**

(Total 13 marks)

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**11.** The gradient of a curve $C$ is given by $\dfrac{dy}{dx} = \dfrac{(x^2+3)^2}{x^2}$, $x \neq 0$.

(a) Show that $\dfrac{dy}{dx} = x^2 + 6 + 9x^{-2}$.

(2)

The point $(3, 20)$ lies on $C$.

(b) Find an equation for the curve $C$ in the form $y = f(x)$.

(6)

**Question 11 continued**

H 2 9 9 9 2 A 0 2 7 2 8

**Question 11 continued**

(Total 8 marks)

**TOTAL FOR PAPER: 75 MARKS**

**END**