

# Edexcel GCE

## Core Mathematics C1

### Advanced Subsidiary

# Algebra and Functions

**Materials required for examination**

Mathematical Formulae (Pink or Green)

**Items included with question papers**

Nil

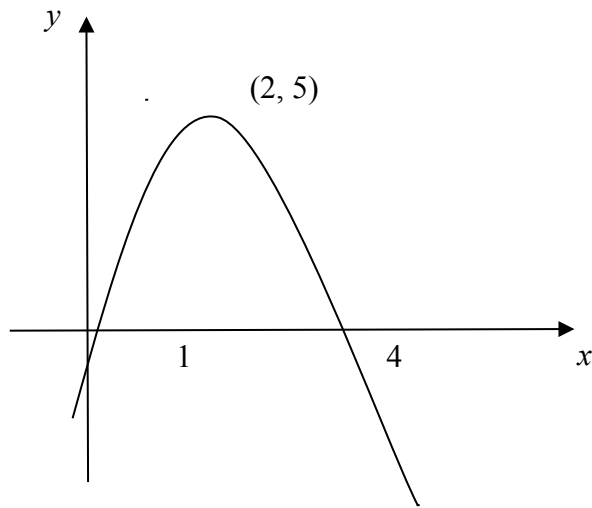
**Calculators may NOT be used in this examination.**

**Advice to Candidates**

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

1.



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve crosses the  $x$ -axis at the points  $(1, 0)$  and  $(4, 0)$ . The maximum point on the curve is  $(2, 5)$ .

In separate diagrams, sketch the curves with the following equations. On each diagram show clearly the coordinates of the maximum point and of each point at which the curve crosses the  $x$ -axis.

(a)  $y = 2f(x)$ , **(3)**

(b)  $y = f(-x)$ . **(3)**

The maximum point on the curve with equation  $y = f(x + a)$  is on the  $y$ -axis.

(c) Write down the value of the constant  $a$ . **(1)**

2. On separate diagrams, sketch the graphs of

(a)  $y = (x + 3)^2$ , **(3)**

(b)  $y = (x + 3)^2 + k$ , where  $k$  is a positive constant. **(2)**

**Show on each sketch the coordinates of each point at which the graph meets the axes.**

3. The point  $P(1, a)$  lies on the curve with equation  $y = (x + 1)^2(2 - x)$ .

(a) Find the value of  $a$ .

(1)

(b) Sketch the curves with the following equations:

(i)  $y = (x + 1)^2(2 - x)$ ,

(ii)  $y = \frac{2}{x}$ .

On your diagram show clearly the coordinates of any points at which the curves meet the axes.

(5)

(c) With reference to your diagram in part (b), state the number of real solutions to the equation

$$(x + 1)^2(2 - x) = \frac{2}{x}.$$

(1)

4. (a) Factorise completely  $x^3 - 6x^2 + 9x$

(3)

(b) Sketch the curve with equation

$$y = x^3 - 6x^2 + 9x$$

showing the coordinates of the points at which the curve meets the  $x$ -axis.

(4)

Using your answer to part (b), or otherwise,

(c) sketch, on a separate diagram, the curve with equation

$$y = (x - 2)^3 - 6(x - 2)^2 + 9(x - 2)$$

showing the coordinates of the points at which the curve meets the  $x$ -axis.

(2)

5.

Figure 1

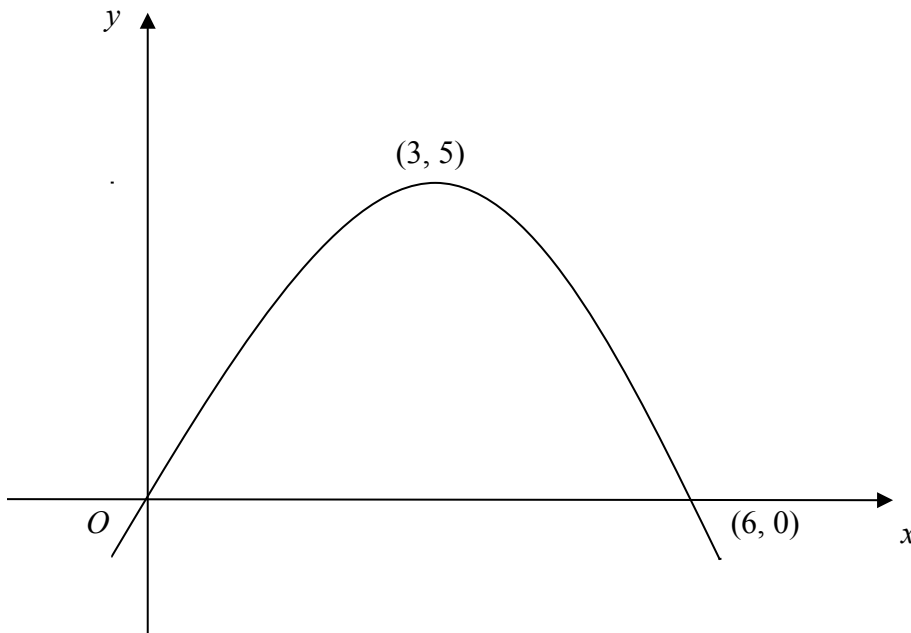


Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve passes through the origin  $O$  and through the point  $(6, 0)$ . The maximum point on the curve is  $(3, 5)$ .

On separate diagrams, sketch the curve with equation

(a)  $y = 3f(x)$ , (2)

(b)  $y = f(x + 2)$ . (3)

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

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

(a) 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)

7.

**Figure 1**

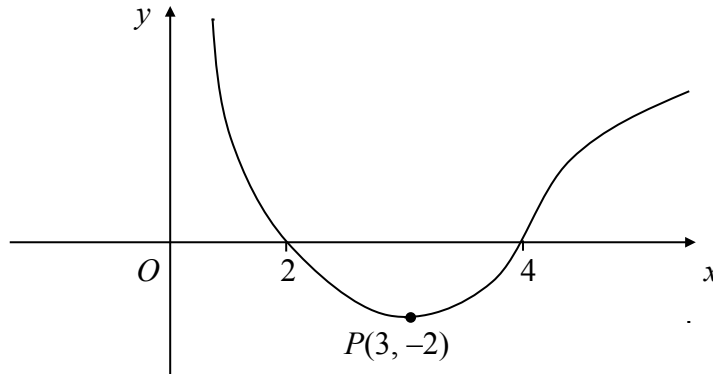


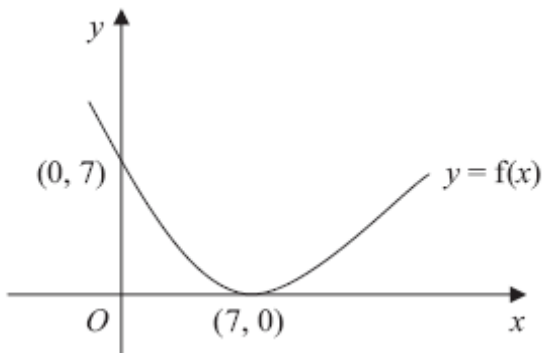
Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve crosses the  $x$ -axis at the points  $(2, 0)$  and  $(4, 0)$ . The minimum point on the curve is  $P(3, -2)$ .

In separate diagrams sketch the curve with equation

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

(b)  $y = f(2x)$ . (3)

On each diagram, give the coordinates of the points at which the curve crosses the  $x$ -axis, and the coordinates of the image of  $P$  under the given transformation.



8.

**Figure 1**

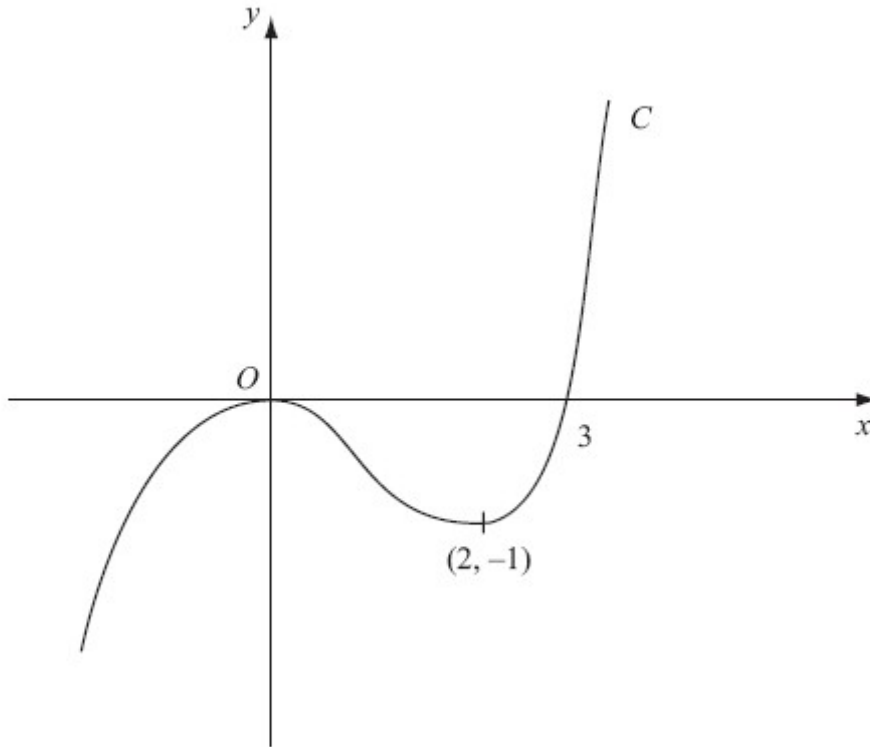
Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve passes through the point  $(0, 7)$  and has a minimum point at  $(7, 0)$ .

On separate diagrams, sketch the curve with equation

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

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

9.



**Figure 1**

Figure 1 shows a sketch of the curve  $C$  with equation  $y = f(x)$ . There is a maximum at  $(0, 0)$ , a minimum at  $(2, -1)$  and  $C$  passes through  $(3, 0)$ .

On separate diagrams, sketch the curve with equation

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

(b)  $y = f(-x)$ . **(3)**

On each diagram show clearly the coordinates of the maximum point, the minimum point and any points of intersection with the  $x$ -axis.

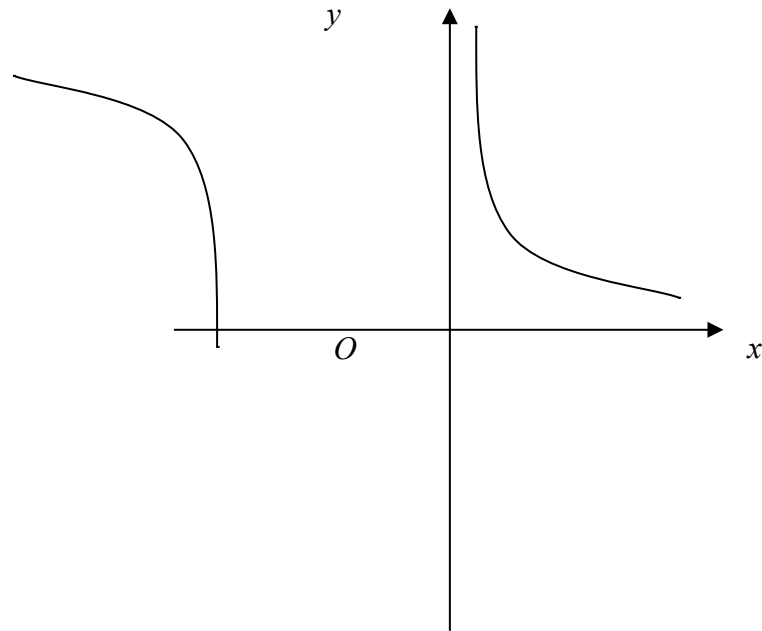
10. Given that  $f(x) = (x^2 - 6x)(x - 2) + 3x$ ,

(a) express  $f(x)$  in the form  $x(ax^2 + bx + c)$ , where  $a$ ,  $b$  and  $c$  are constants. **(3)**

(b) Hence factorise  $f(x)$  completely. **(2)**

(c) Sketch the graph of  $y = f(x)$ , showing the coordinates of each point at which the graph meets the axes. **(3)**

11.



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = \frac{3}{x}$ ,  $x \neq 0$ .

(a) On a separate diagram, sketch the curve with equation  $y = \frac{3}{x+2}$ ,  $x \neq -2$ , showing the coordinates of any point at which the curve crosses a coordinate axis. (3)

(b) Write down the equations of the asymptotes of the curve in part (a). (2)

12. Given that  $f(x) = \frac{1}{x}$ ,  $x \neq 0$ ,

(a) sketch the graph of  $y = f(x) + 3$  and state the equations of the asymptotes. (4)

(b) Find the coordinates of the point where  $y = f(x) + 3$  crosses a coordinate axis. (2)

13.

Figure 1

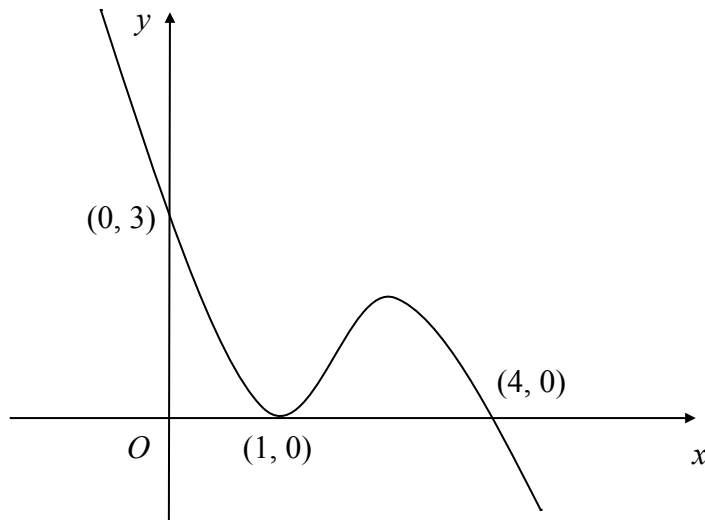


Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve passes through the points  $(0, 3)$  and  $(4, 0)$  and touches the  $x$ -axis at the point  $(1, 0)$ .

On separate diagrams, sketch the curve with equation

(a)  $y = f(x + 1)$ , (3)

(b)  $y = 2f(x)$ , (3)

(c)  $y = f\left(\frac{1}{2}x\right)$ . (3)

On each diagram show clearly the coordinates of all the points at which the curve meets the axes.

14. (a) On the same axes sketch the graphs of the curves with equations

(i)  $y = x^2(x - 2)$ , (3)

(ii)  $y = x(6 - x)$ , (3)

and indicate on your sketches the coordinates of all the points where the curves cross the  $x$ -axis.

(b) Use algebra to find the coordinates of the points where the graphs intersect. (7)

END