Sketching Graphs

Question Paper 5

Level	A LEVEL
Exam Board	Edexcel GCE
Subject	Mathematics
Module	Core 1
Topic	Algebra and Functions
Sub-Topic	Sketching Graphs
Booklet	Question Paper 5

Time Allowed: **62 minutes**

Score: **/ 51**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	777.5%	70%	62.5%	57.5%	45%	<45%

1. The curve C has equation

$$y = \frac{(x+3)(x-8)}{x} \quad , \quad x > 0$$

(a) Find $\frac{dy}{dx}$ in its simplest form.

(4)

(b) Find an equation of the tangent to C at the point where $x = 2$

(4)

2.

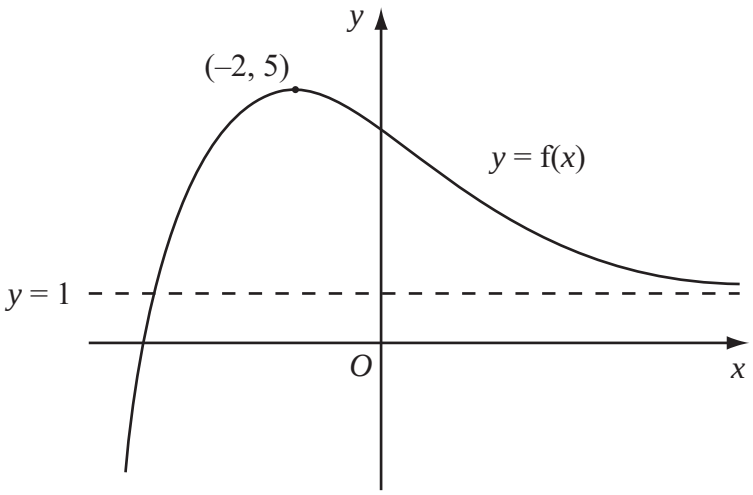


Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = f(x)$.

The curve has a maximum point $(–2, 5)$ and an asymptote $y = 1$, as shown in Figure 1.

On separate diagrams, sketch the curve with equation

(a) $y = f(x) + 2$

(2)

(b) $y = 4f(x)$

(2)

(c) $y = f(x + 1)$

(3)

On each diagram, show clearly the coordinates of the maximum point and the equation of the asymptote.

Question 2 continued

(Total 7 marks)

3. $f(x) = x^2 + 4kx + (3+11k)$, where k is a constant.

(a) Express $f(x)$ in the form $(x+p)^2 + q$, where p and q are constants to be found in terms of k.

(3)

Given that the equation $f(x) = 0$ has no real roots,

(b) find the set of possible values of k.

(4)

Given that $k = 1$,

(c) sketch the graph of $y = f(x)$, showing the coordinates of any point at which the graph crosses a coordinate axis.

(3)

Question 3 continued

(Total 10 marks)

4 (a) Factorise completely $x^3 - 4x$

(3)

(b) Sketch the curve C with equation

$$y = x^3 - 4x,$$

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

(3)

The point A with x-coordinate -1 and the point B with x-coordinate 3 lie on the curve C.

(c) Find an equation of the line which passes through A and B, giving your answer in the form $y = mx + c$, where m and c are constants.

(5)

(d) Show that the length of AB is $k\sqrt{10}$, where k is a constant to be found.

(2)

Question 4 continued

5.

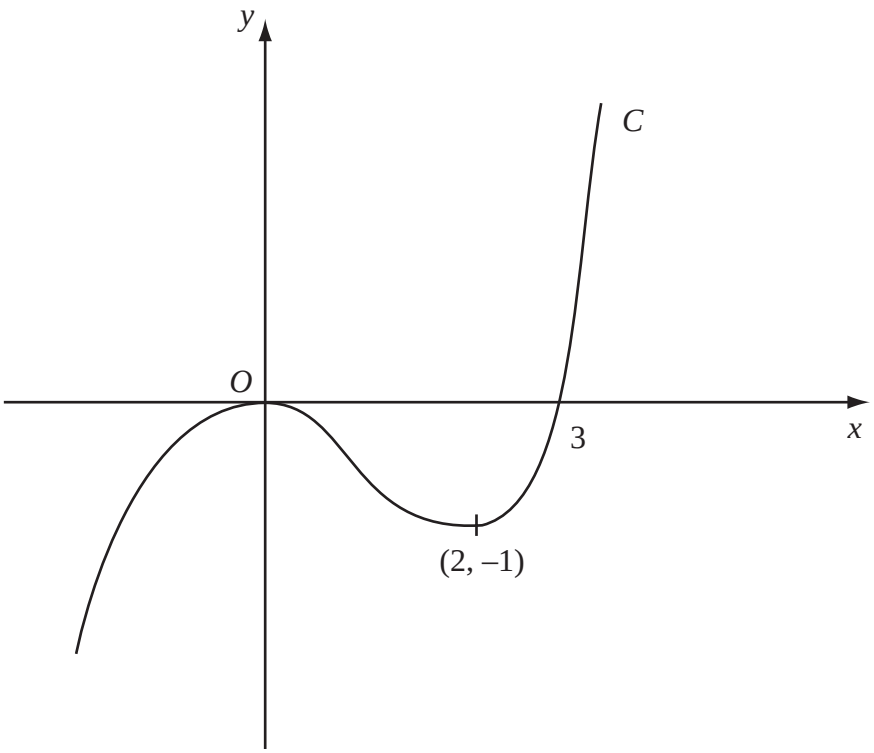


Figure 1

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.

Question 5 continued

(Total 6 marks)

6 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) On the axes below sketch the curves with the following equations:

(i) $y = (x + 1)^2(2 – x)$,

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

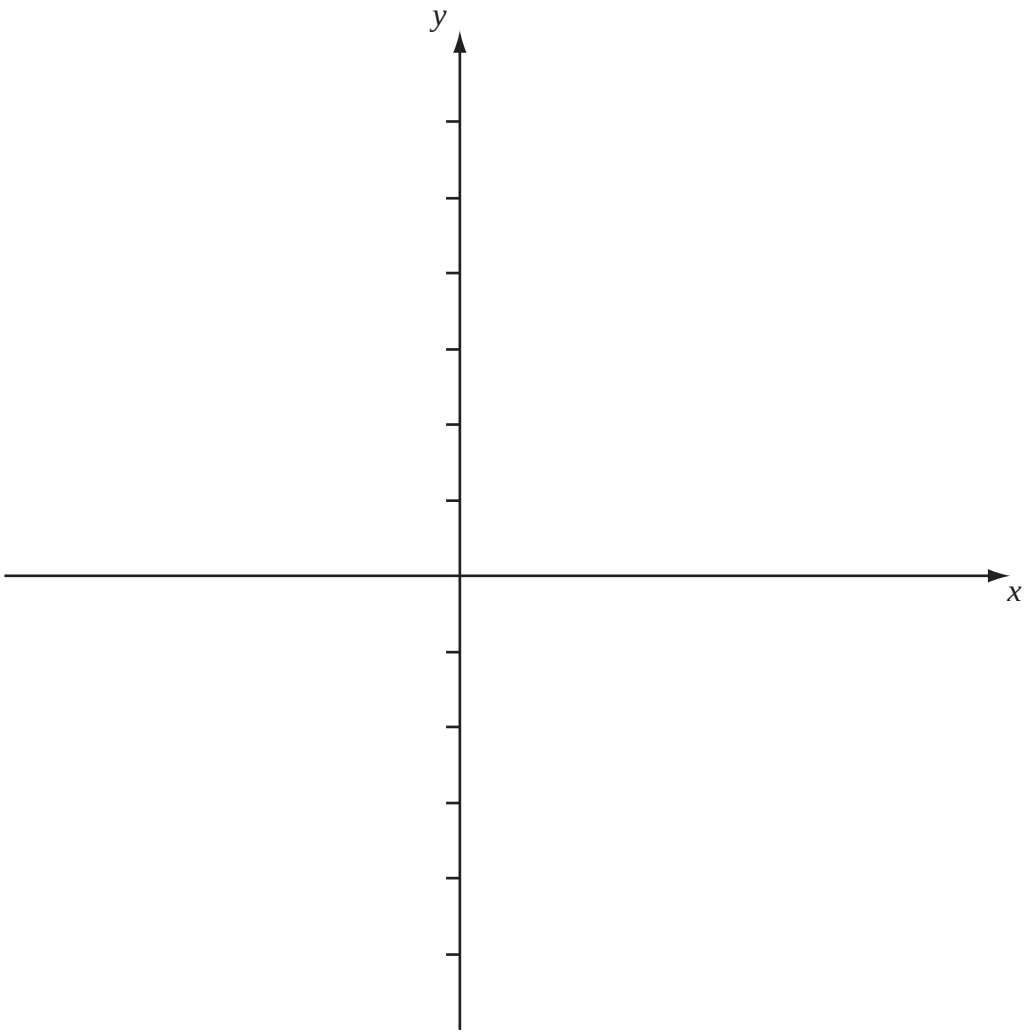
On your diagram show clearly the coordinates of any points at which the curves meet the axes.

(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)



Question 6 continued

(Total 7 marks)