Edexcel Maths C1

Topic Questions from Papers

Curve Sketching

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4.

Figure 1

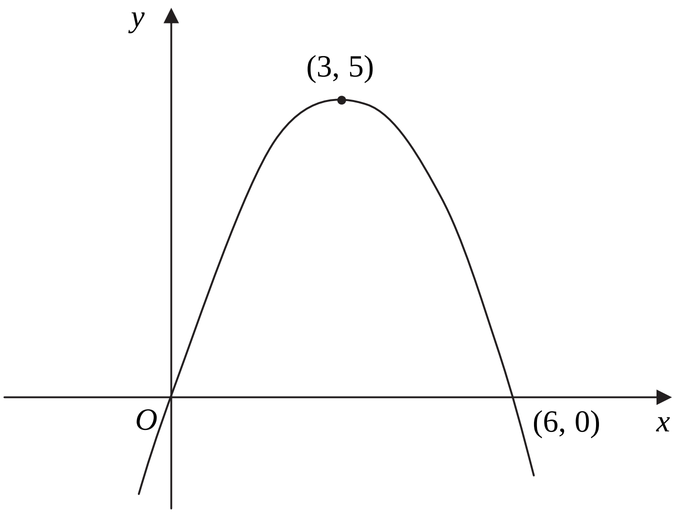

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve passes through the origin O and through the point (6, 0). The maximum point on the curve is (3, 5).

On separate diagrams, sketch the curve with equation

(a) $y = 3\mathrm{f}(x)$,

(2)

(b) $y = \mathrm{f}(x + 2)$.

(3)

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

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6. **Figure 1**

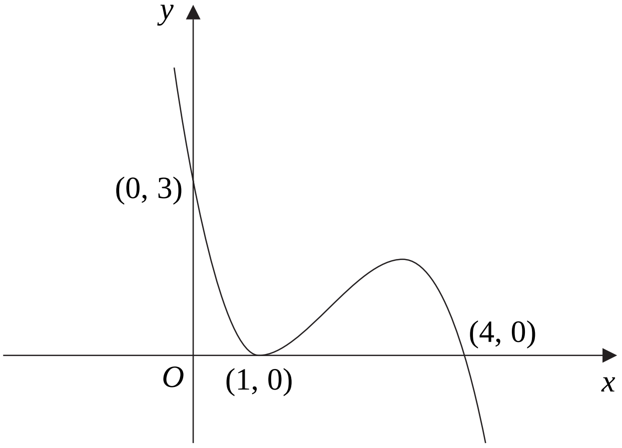

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points (0, 3) and (4, 0) and touches the x-axis at the point (1, 0).

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 where the curve meets the axes.

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Question 6 continued

Q6

(Total 9 marks)

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10. $$x^2 + 2x + 3 \equiv (x + a)^2 + b.$$

(a) Find the values of the constants a and b.

(2)

(b) In the space provided below, sketch the graph of $y = x^2 + 2x + 3$, indicating clearly the coordinates of any intersections with the coordinate axes.

(3)

(c) Find the value of the discriminant of $x^2 + 2x + 3$. Explain how the sign of the discriminant relates to your sketch in part (b).

(2)

The equation $x^2 + kx + 3 = 0$, where k is a constant, has no real roots.

(d) Find the set of possible values of k, giving your answer in surd form.

(4)

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Question 10 continued

Q10

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END

N 2 0 2 3 3 A 0 2 0 2 0

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9. 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)

N 2 3 5 5 7 A 0 1 6 2 4

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

(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)

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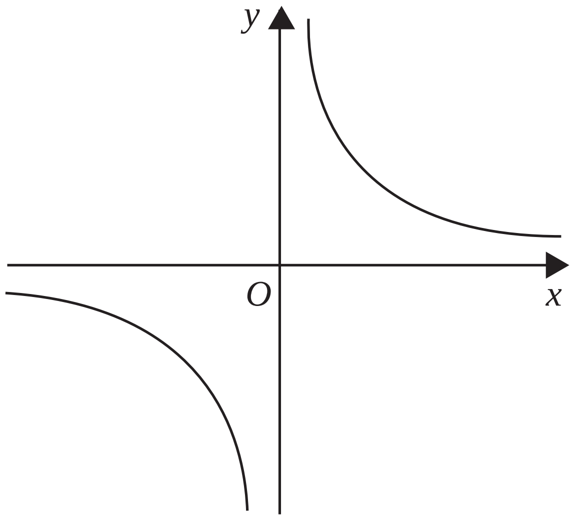

Figure 1

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)

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6.

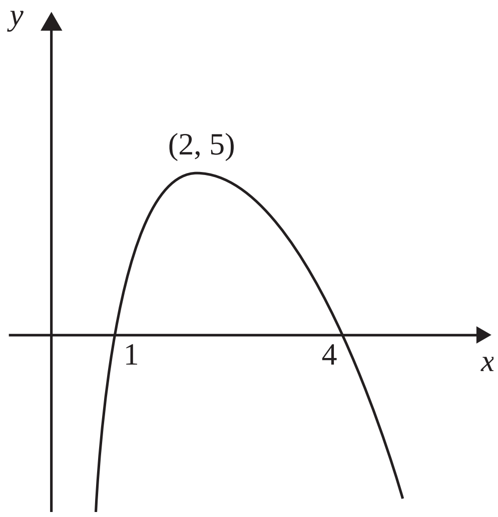

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \text{f}(x)$. 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) $y = 2\text{f}(x)$,

(3)

(b) $y = \text{f}(-x)$.

(3)

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

(c) Write down the value of the constant a.

(1)

Leave blank

Question 6 continued

Q6

(Total 7 marks)

Leave blank

10. The curve C has equation

$$y = (x+3)(x-1)^2 .$$

(a) Sketch C showing clearly the coordinates of the points where the curve meets the coordinate axes.

(4)

(b) Show that the equation of C can be written in the form

$$y = x^3 + x^2 - 5x + k,$$

where k is a positive integer, and state the value of k.

(2)

There are two points on C where the gradient of the tangent to C is equal to 3.

(c) Find the x-coordinates of these two points.

(6)

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Question 10 continued

Q10

(Total 12 marks)

N 2 5 5 6 1 A 0 1 9 2 4

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3.

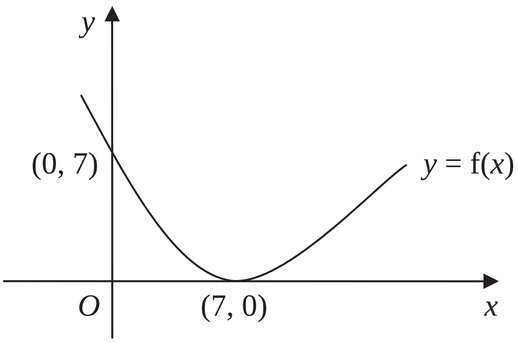

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. 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) $y = \mathrm{f}(x) + 3$,

(3)

(b) $y = \mathrm{f}(2x)$.

(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.

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5.

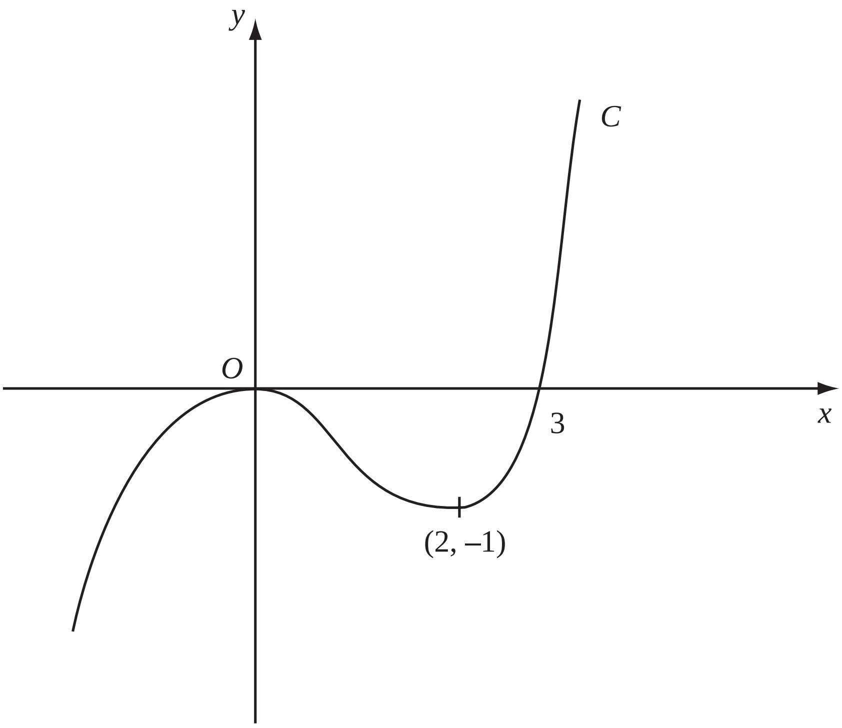

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$. 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) $y = \mathrm{f}(x + 3)$,

(3)

(b) $y = \mathrm{f}(-x)$.

(3)

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

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Question 5 continued

Q5

(Total 6 marks)

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8. 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) $y = \frac{2}{x}$.

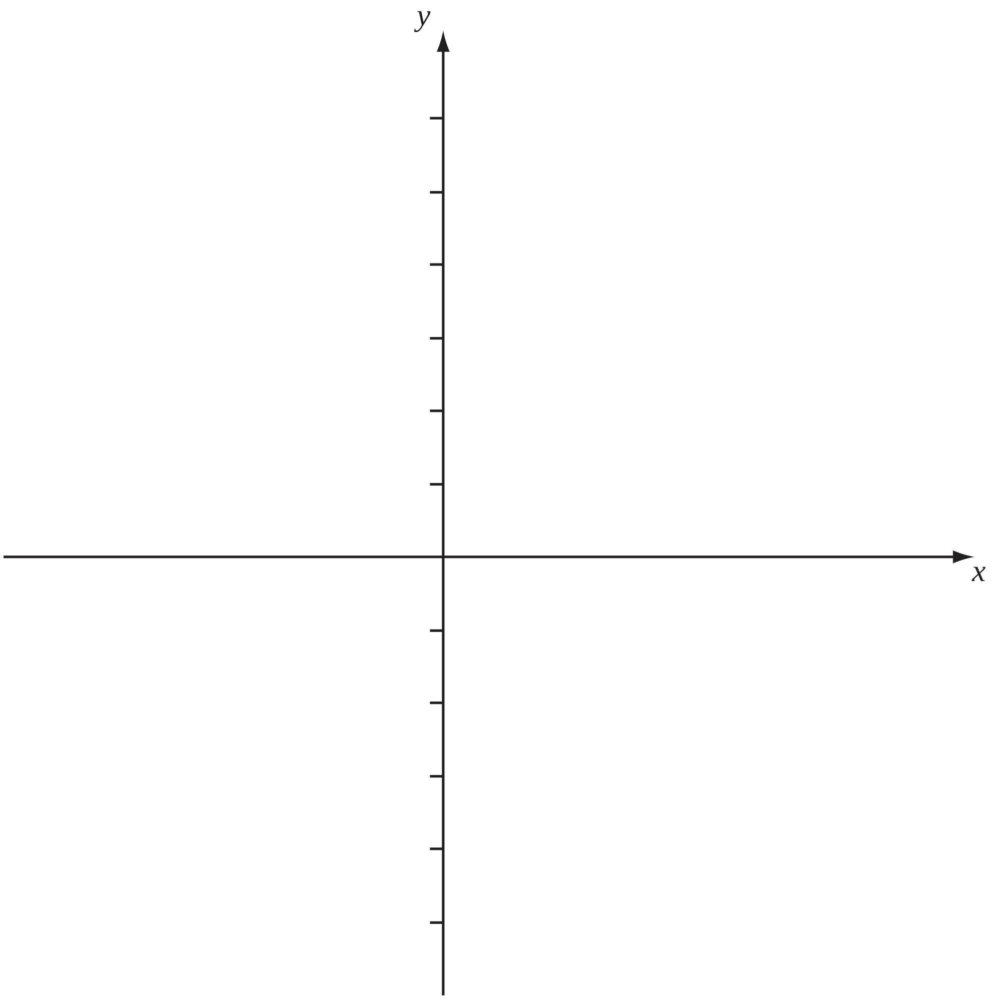
On your diagram show clearly the coordinates of any points at which the curves meet the axes.

(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)



N 3 0 0 8 1 A 0 1 4 2 8

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Question 8 continued

Q8

(Total 7 marks)

Turn over

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10. (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)

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Question 10 continued

H 3 4 2 6 2 A 0 2 3 2 8

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8.

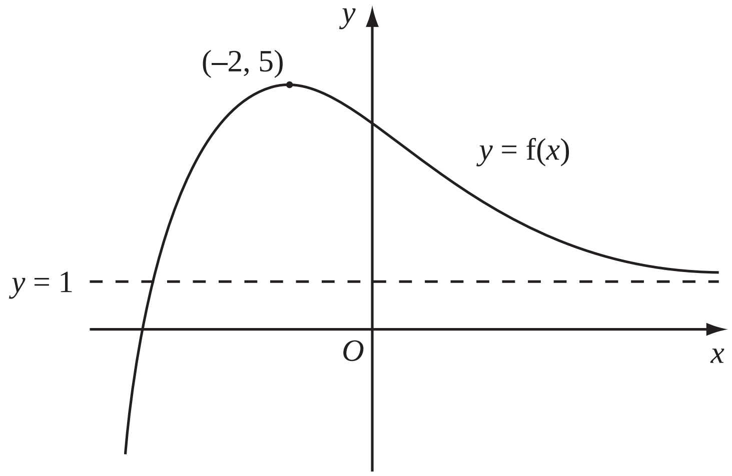

Figure 1

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

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) $y = \mathrm{f}(x) + 2$

(2)

(b) $y = 4\mathrm{f}(x)$

(2)

(c) $y = \mathrm{f}(x + 1)$

(3)

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

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Question 8 continued

Q8

(Total 7 marks)

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6.

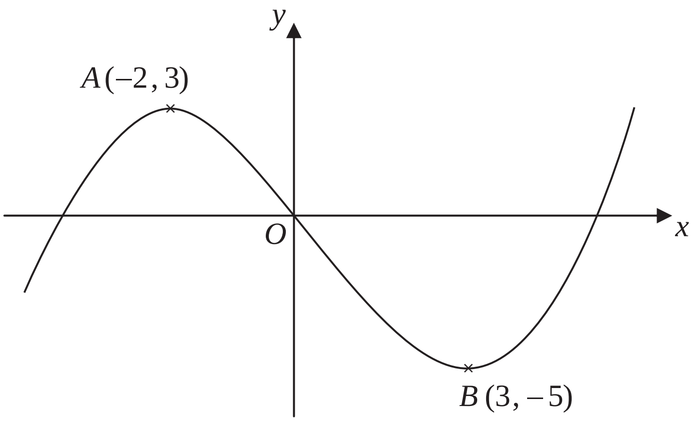

Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve has a maximum point A at (–2, 3) and a minimum point B at (3, –5).

On separate diagrams sketch the curve with equation

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

(3)

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

(3)

On each diagram show clearly the coordinates of the maximum and minimum points.

The graph of $y = f(x) + a$ has a minimum at (3, 0), where a is a constant.

(c) Write down the value of a.

(1)

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Question 6 continued

Q6

(Total 7 marks)

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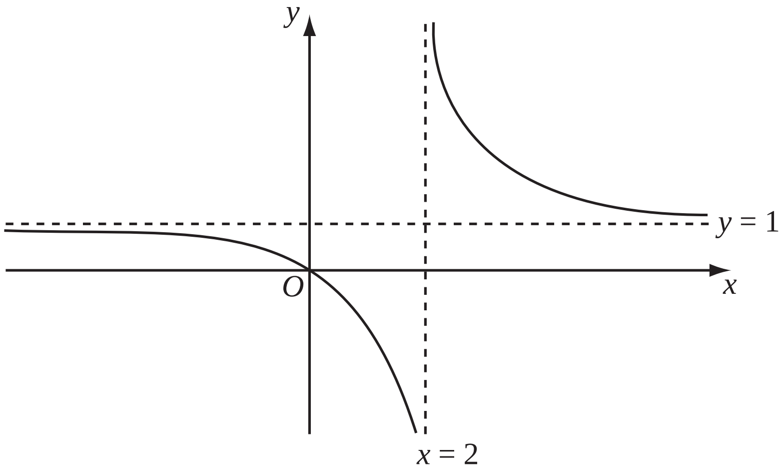

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{x}{x-2}, \qquad x \neq 2$$

The curve passes through the origin and has two asymptotes, with equations $y = 1$ and $x = 2$, as shown in Figure 1.

(a) In the space below, sketch the curve with equation $y = \mathrm{f}(x-1)$ and state the equations of the asymptotes of this curve.

(3)

(b) Find the coordinates of the points where the curve with equation $y = \mathrm{f}(x-1)$ crosses the coordinate axes.

(4)

H 3 5 4 0 2 A 0 8 2 4

Leave blank

Question 5 continued

Q5

(Total 7 marks)

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10. (a) On the axes below, sketch the graphs of

(i) $y = x(x+2)(3-x)$

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

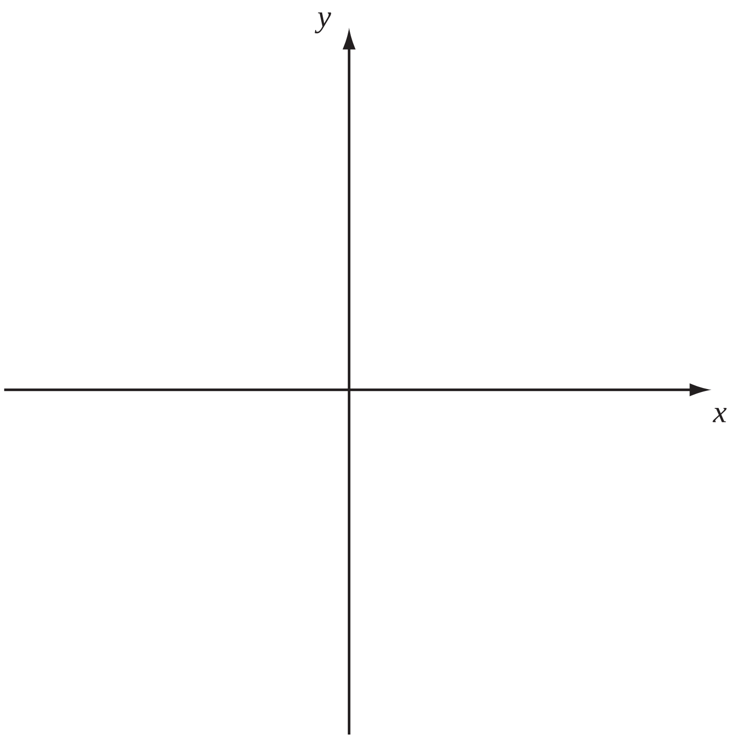
showing clearly the coordinates of all the points where the curves cross the coordinate axes.

(6)

(b) Using your sketch state, giving a reason, the number of real solutions to the equation

$$x(x+2)(3-x) + \frac{2}{x} = 0$$

(2)



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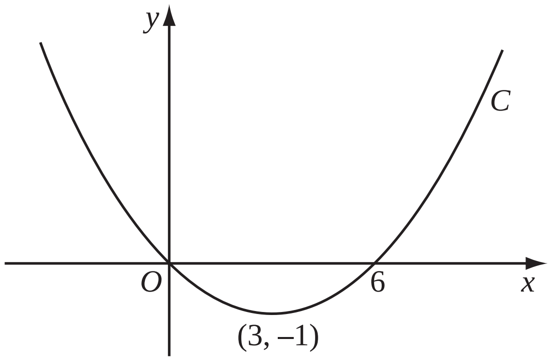

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$.
The curve C passes through the origin and through $(6, 0)$.
The curve C has a minimum at the point $(3, -1)$.

On separate diagrams, sketch the curve with equation

(a) $y = \mathrm{f}(2x)$,
(3)

(b) $y = -\mathrm{f}(x)$,
(3)

(c) $y = \mathrm{f}(x + p)$, where p is a constant and $0 < p < 3$.
(4)

On each diagram show the coordinates of any points where the curve intersects the x-axis and of any minimum or maximum points.

Leave blank

Question 8 continued

Leave blank

5. The curve C has equation $y = x(5 - x)$ and the line L has equation $2y = 5x + 4$

(a) Use algebra to show that C and L do not intersect.

(4)

(b) In the space on page 11, sketch C and L on the same diagram, showing the coordinates of the points at which C and L meet the axes.

(4)

Leave blank

8. The curve C_1 has equation

$$y = x^2(x+2)$$

(a) Find $\frac{dy}{dx}$

(2)

(b) Sketch C_1, showing the coordinates of the points where C_1 meets the x-axis.

(3)

(c) Find the gradient of C_1 at each point where C_1 meets the x-axis.

(2)

The curve C_2 has equation

$$y = (x-k)^2(x-k+2)$$

where k is a constant and $k > 2$

(d) Sketch C_2, showing the coordinates of the points where C_2 meets the x and y axes.

(3)

P 4 0 0 8 2 A 0 1 8 2 8

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Question 8 continued

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10.

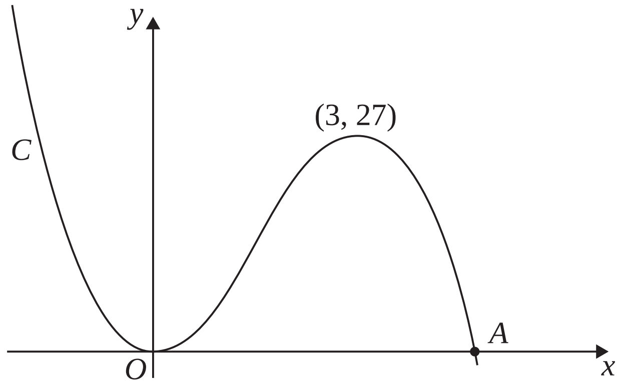

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = \text{f}(x)$ where

$$\text{f}(x) = x^2(9 - 2x)$$

There is a minimum at the origin, a maximum at the point (3, 27) and C cuts the x-axis at the point A.

(a) Write down the coordinates of the point A.

(1)

(b) On separate diagrams sketch the curve with equation

(i) $y = \text{f}(x + 3)$

(ii) $y = \text{f}(3x)$

On each sketch you should indicate clearly the coordinates of the maximum point and any points where the curves cross or meet the coordinate axes.

(6)

The curve with equation $y = \text{f}(x) + k$, where k is a constant, has a maximum point at (3, 10).

(c) Write down the value of k.

(1)

Leave blank

Question 10 continued

Q10

(Total 8 marks)

TOTAL FOR PAPER: 75 MARKS

END

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10. $$4x^2 + 8x + 3 \equiv a(x+b)^2 + c$$

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

(3)

(b) On the axes on page 27, sketch the curve with equation $y = 4x^2 + 8x + 3$, showing clearly the coordinates of any points where the curve crosses the coordinate axes.

(4)

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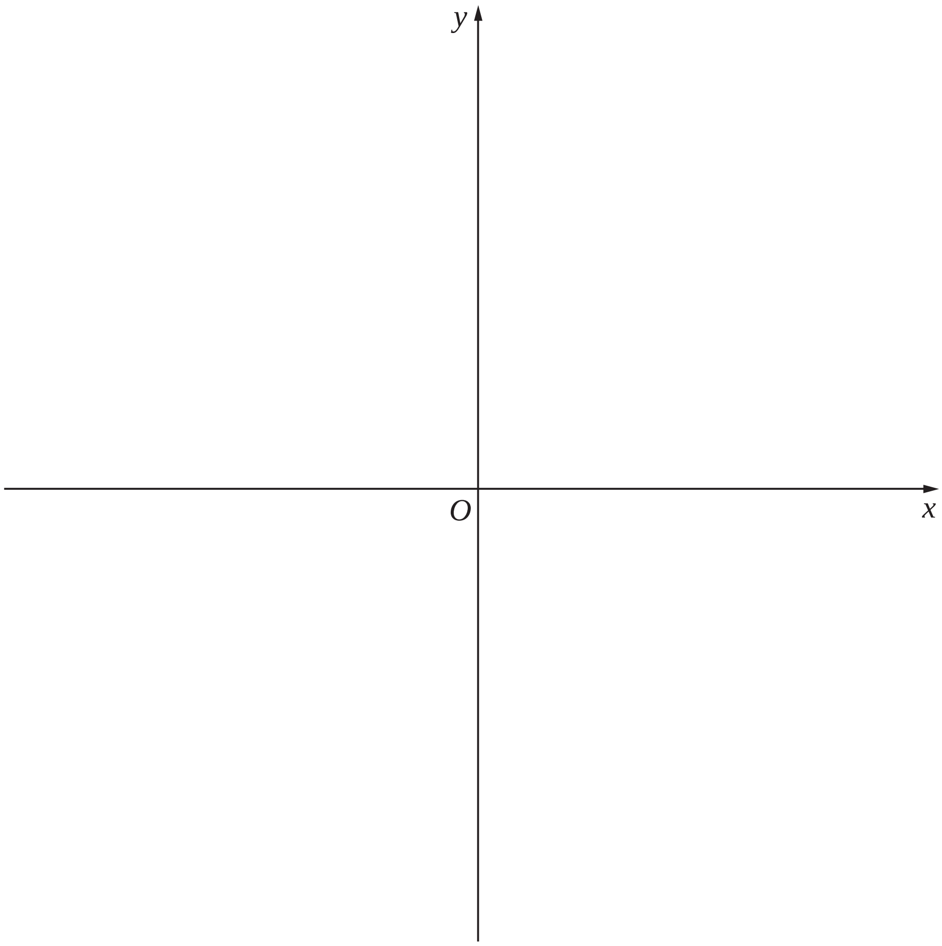
Question 10 continued



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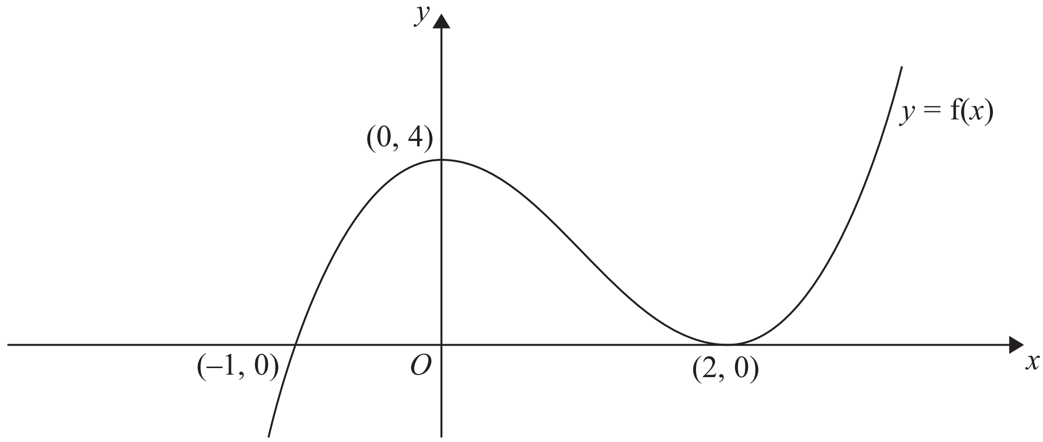

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$.

The curve C passes through the point (–1, 0) and touches the x-axis at the point (2, 0).

The curve C has a maximum at the point (0, 4).

(a) The equation of the curve C can be written in the form

$$y = x^3 + ax^2 + bx + c$$

where a, b and c are integers.

Calculate the values of a, b and c.

(5)

(b) Sketch the curve with equation $y = \mathrm{f}(\tfrac{1}{2}x)$ in the space provided on page 24

Show clearly the coordinates of all the points where the curve crosses or meets the coordinate axes.

(3)

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Question 9 continued

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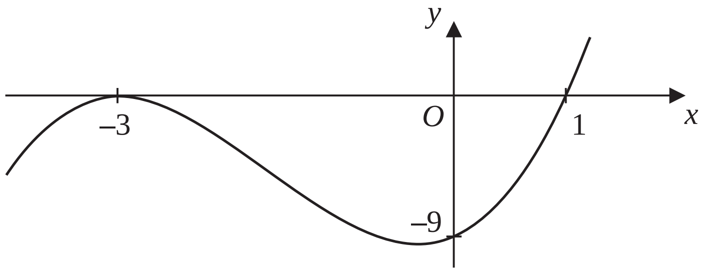

Figure 1

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

$$f(x) = (x + 3)^2 (x - 1), \qquad x \in \mathbb{R}.$$

The curve crosses the x-axis at (1, 0), touches it at (–3, 0) and crosses the y-axis at (0, –9)

(a) In the space below, sketch the curve C with equation $y = f(x + 2)$ and state the coordinates of the points where the curve C meets the x-axis.

(3)

(b) Write down an equation of the curve C.

(1)

(c) Use your answer to part (b) to find the coordinates of the point where the curve C meets the y-axis.

(2)

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Question 8 continued

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11.

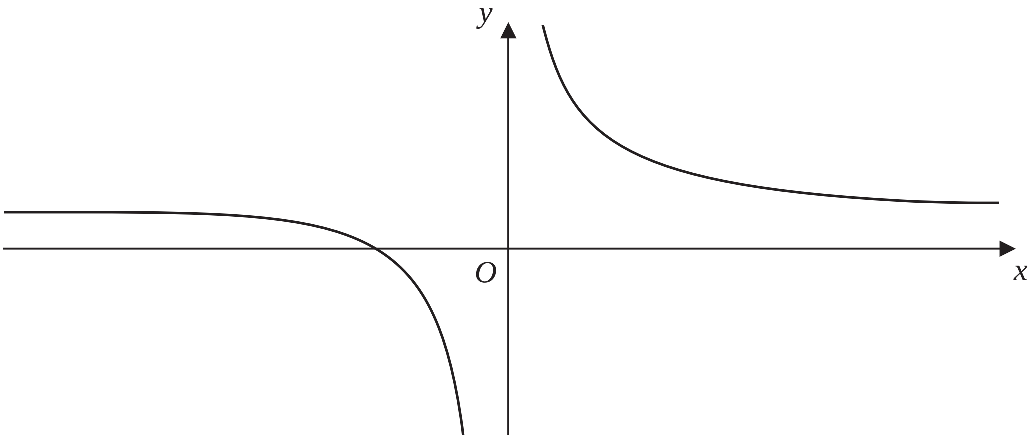

Figure 2

Figure 2 shows a sketch of the curve H with equation $y = \frac{3}{x} + 4, \; x \neq 0$.

(a) Give the coordinates of the point where H crosses the x-axis.
(1)

(b) Give the equations of the asymptotes to H.
(2)

(c) Find an equation for the normal to H at the point $P(-3, 3)$.
(5)

This normal crosses the x-axis at A and the y-axis at B.

(d) Find the length of the line segment AB. Give your answer as a surd.
(3)

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Question 11 continued

Q11

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END

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4.

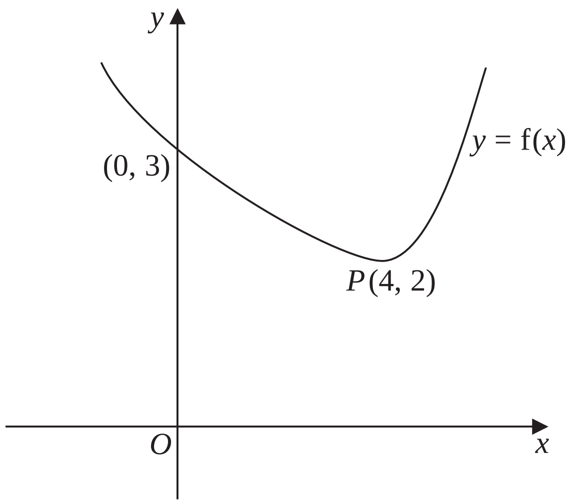

Figure 1

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

The curve crosses the y-axis at (0, 3) and has a minimum at P (4, 2).

On separate diagrams, sketch the curve with equation

(a) $y = f(x + 4)$,

(2)

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

(2)

On each diagram, show clearly the coordinates of the minimum point and any point of intersection with the y-axis.

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Question 4 continued

Q4

(Total 4 marks)

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4.

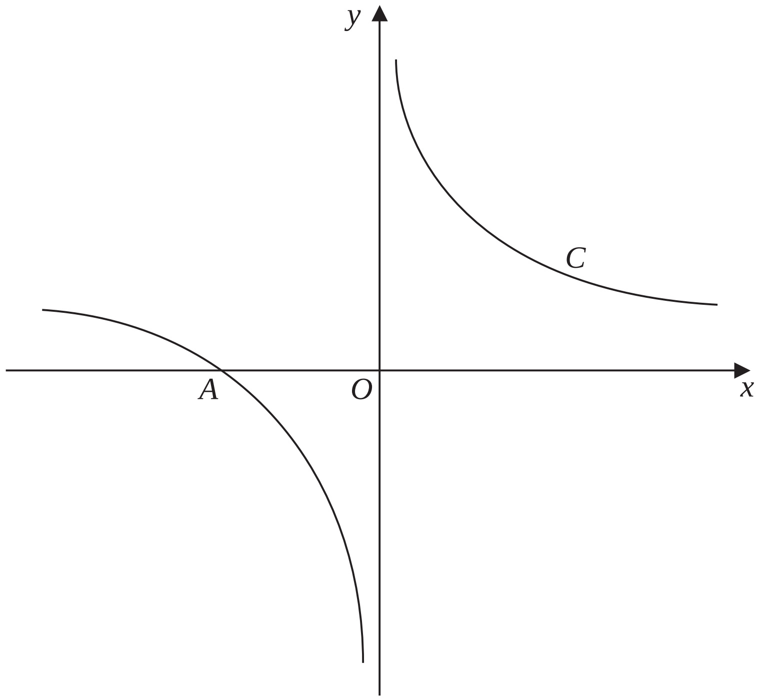

Figure 1

Figure 1 shows a sketch of the curve *C* with equation

$$y = \frac{1}{x} + 1, \qquad x \neq 0$$

The curve *C* crosses the *x*-axis at the point *A*.

(a) State the *x* coordinate of the point *A*.

(1)

The curve *D* has equation $y = x^2(x - 2)$, for all real values of *x*.

(b) A copy of Figure 1 is shown on page 7.
On this copy, sketch a graph of curve *D*.
Show on the sketch the coordinates of each point where the curve *D* crosses the coordinate axes.

(3)

(c) Using your sketch, state, giving a reason, the number of real solutions to the equation

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

(1)

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Question 4 continued

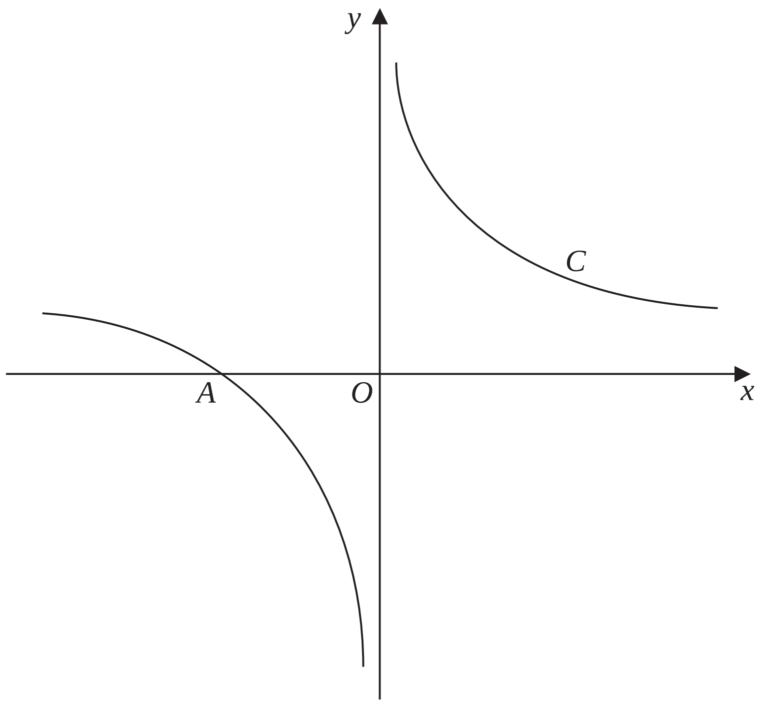

Figure 1

Q4

(Total 5 marks)

P 4 3 0 1 4 A 0 7 2 8

Turn over

Core Mathematics C1

Mensuration

Surface area of sphere = $4\pi r^2$

Area of curved surface of cone = $\pi r \times$ slant height

Arithmetic series

$u_n = a + (n - 1)d$

$S_n = \frac{1}{2}n(a + l) = \frac{1}{2}n[2a + (n - 1)d]$