

6.

Figure 1

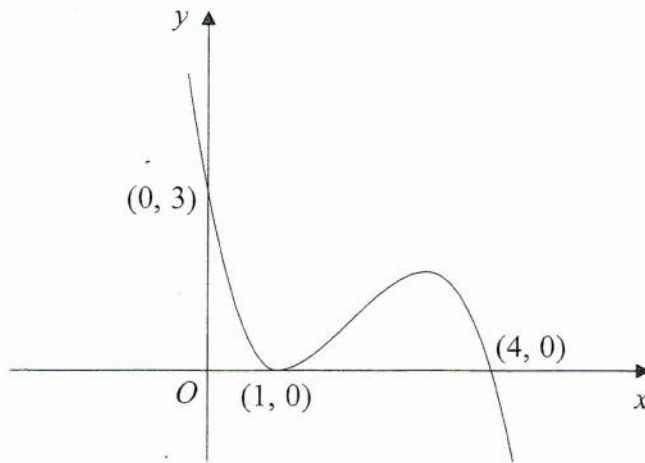


Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points $(0, 3)$ and $(4, 0)$ and touches the x -axis at the point $(1, 0)$.

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.



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)



10. (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)



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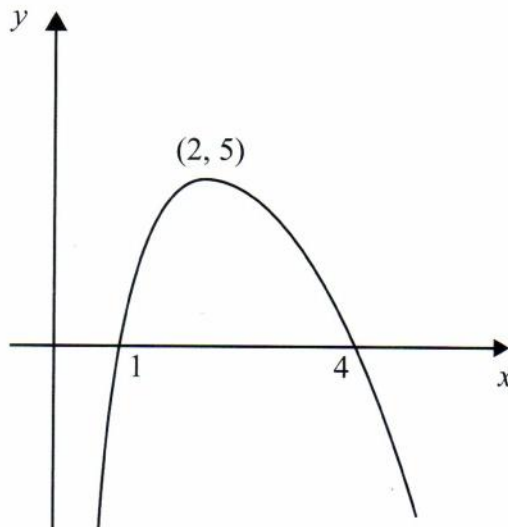


Figure 1

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)



JAN 2009

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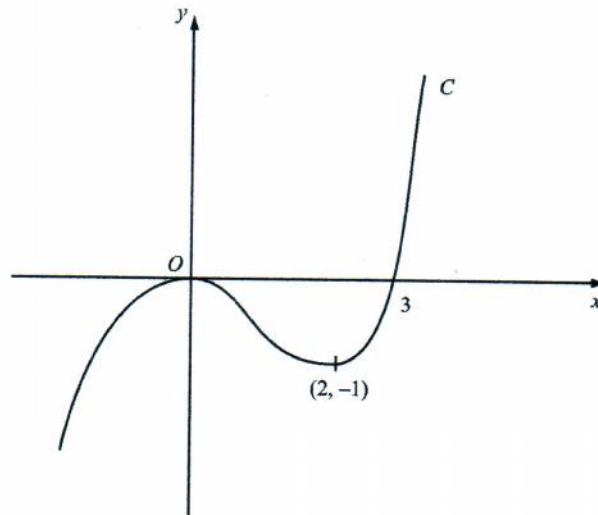


Figure 1

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.



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

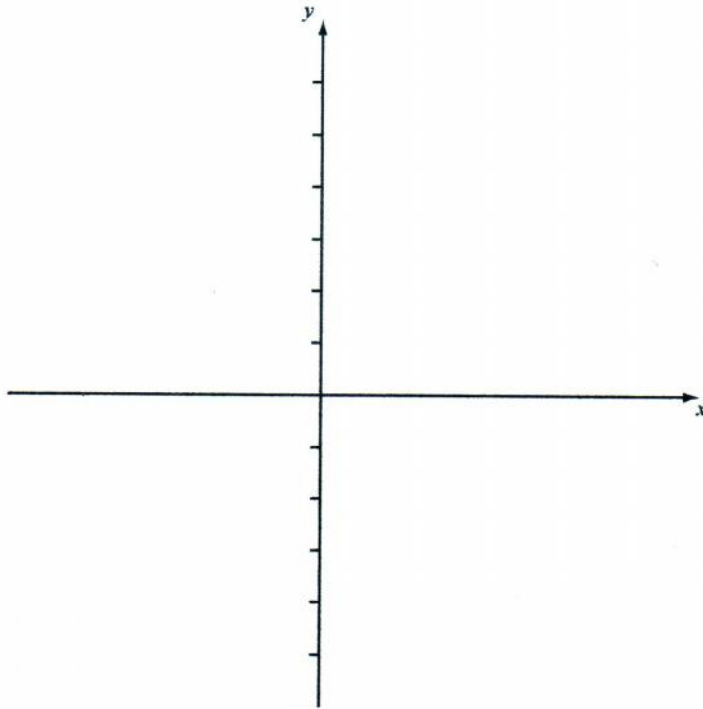
On your diagram show clearly the coordinates of any points at which the curves meet the axes.

(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)



5.

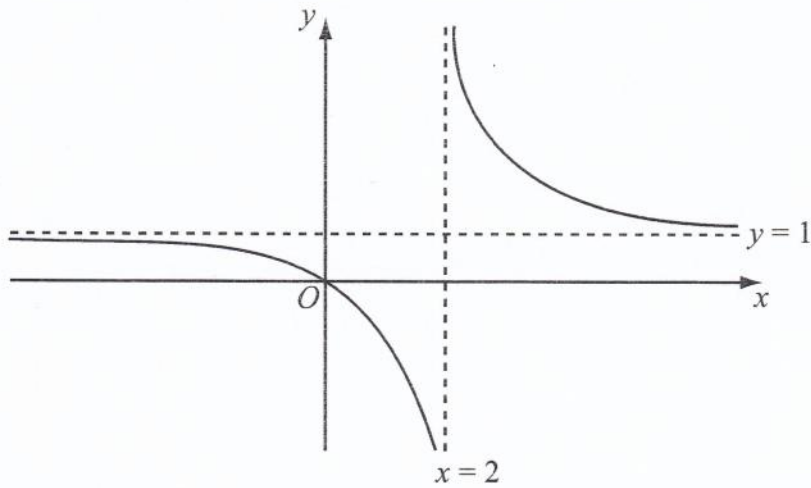


Figure 1

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

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

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 $y = f(x-1)$ and state the equations of the asymptotes of this curve. (3)

- (b) Find the coordinates of the points where the curve with equation $y = f(x-1)$ crosses the coordinate axes. (4)



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

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

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

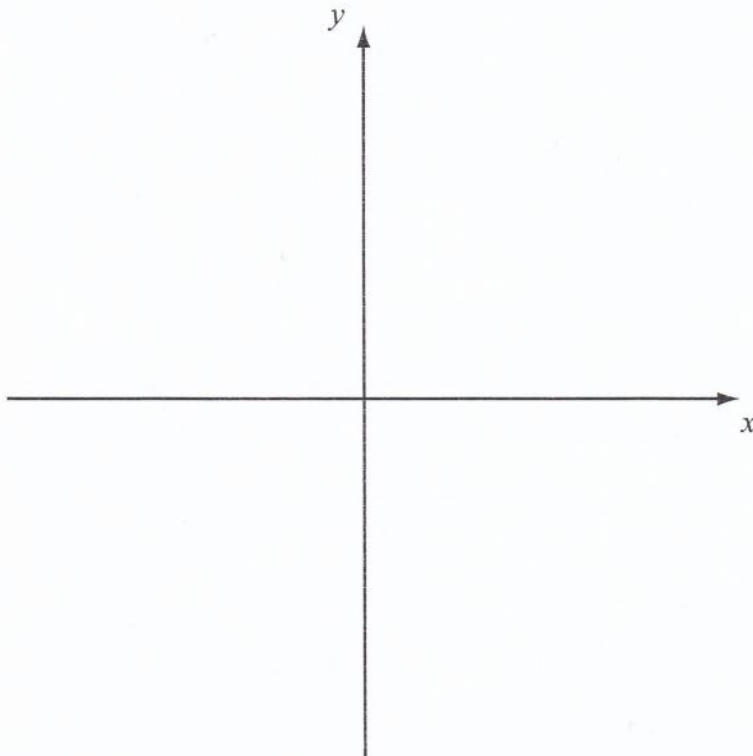
showing clearly the coordinates of all the points where the curves cross the coordinate axes.

(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)



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)



3.

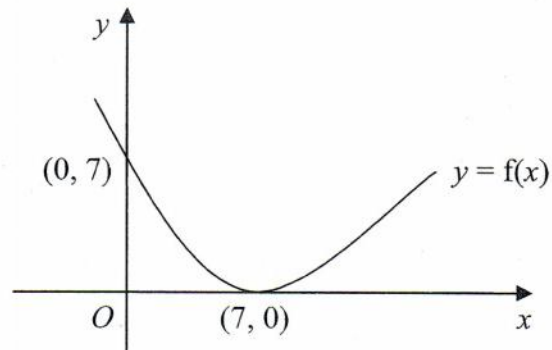
**Figure 1**

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

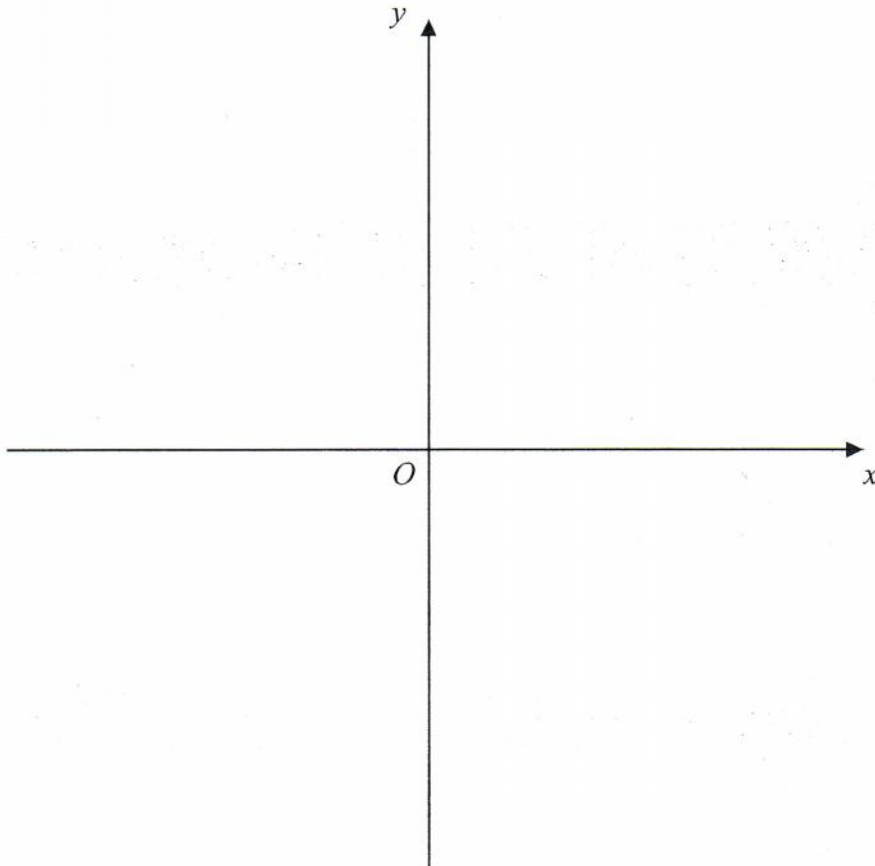
(a) $y = f(x) + 3$, (3)

(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.



6. The curve C has equation $y = \frac{3}{x}$ 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)



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)

Lined area for sketching the curve.



MAY 2006

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3. 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.



5.

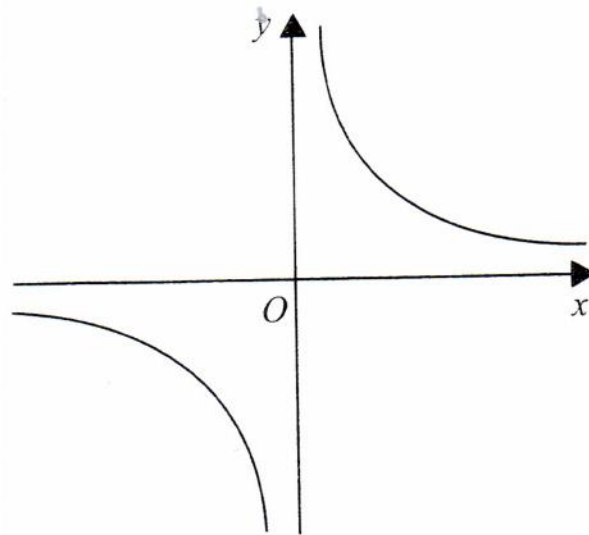


Figure 1

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)



6.

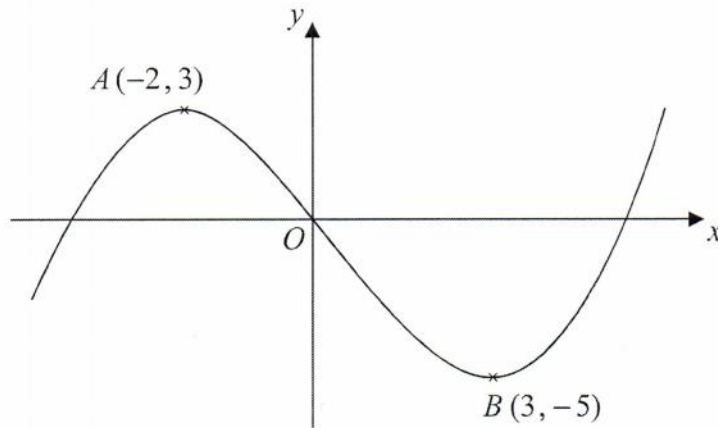


Figure 1

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)



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

(i) $y = x(4-x)$

(ii) $y = x^2(7-x)$

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

(5)

(b) Show that the x -coordinates of the points of intersection of

$$y = x(4-x) \quad \text{and} \quad y = x^2(7-x)$$

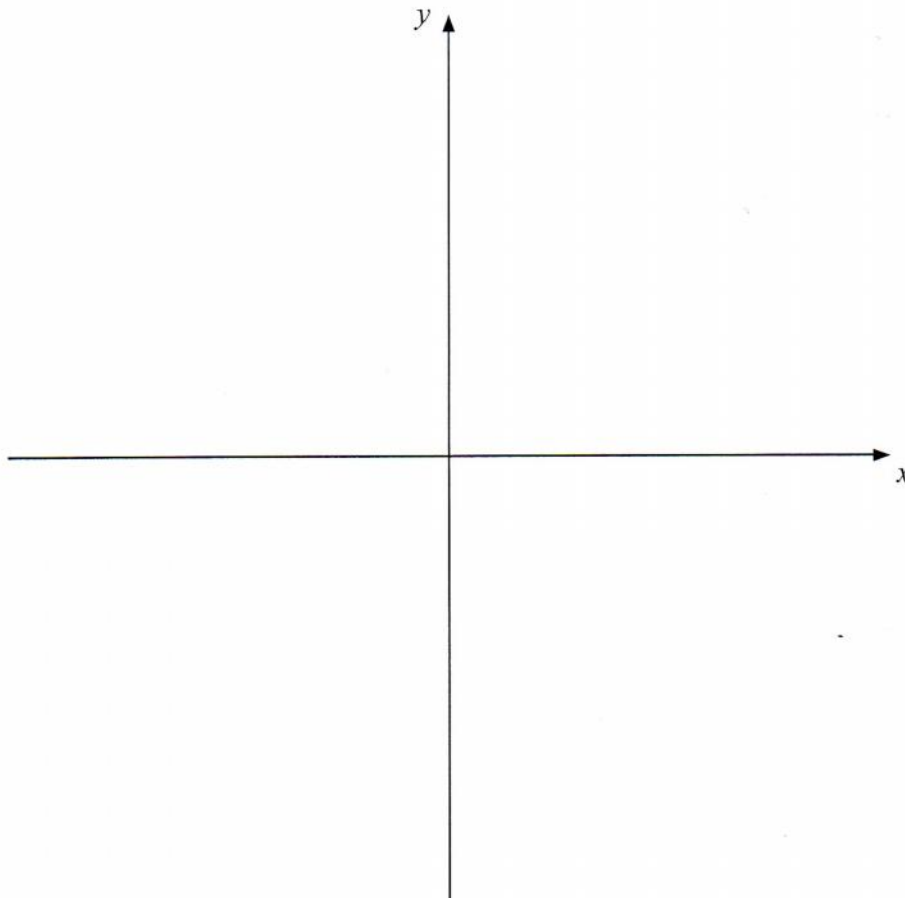
are given by the solutions to the equation $x(x^2 - 8x + 4) = 0$

(3)

The point A lies on both of the curves and the x and y coordinates of A are both positive.

(c) Find the exact coordinates of A , leaving your answer in the form $(p + q\sqrt{3}, r + s\sqrt{3})$, where p, q, r and s are integers.

(7)



8.

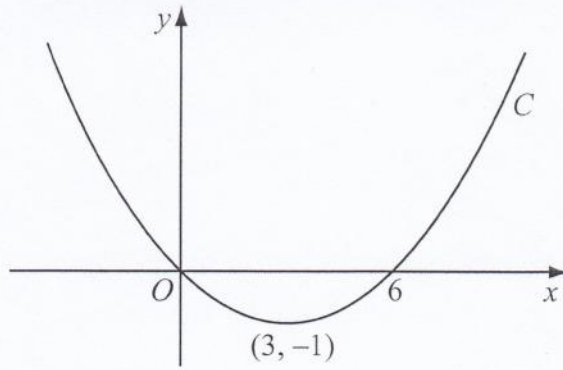


Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$.
 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) $y = f(2x)$, (3)

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

(c) $y = f(x + p)$, 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.



10.

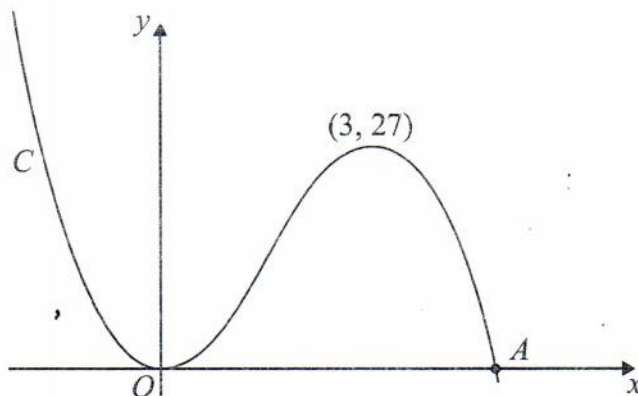


Figure 1

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

$$f(x) = x^2(9 - 2x)$$

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) $y = f(x + 3)$

(ii) $y = f(3x)$

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 $y = f(x) + k$, where k is a constant, has a maximum point at $(3, 10)$.

(c) Write down the value of k . (1)



6.

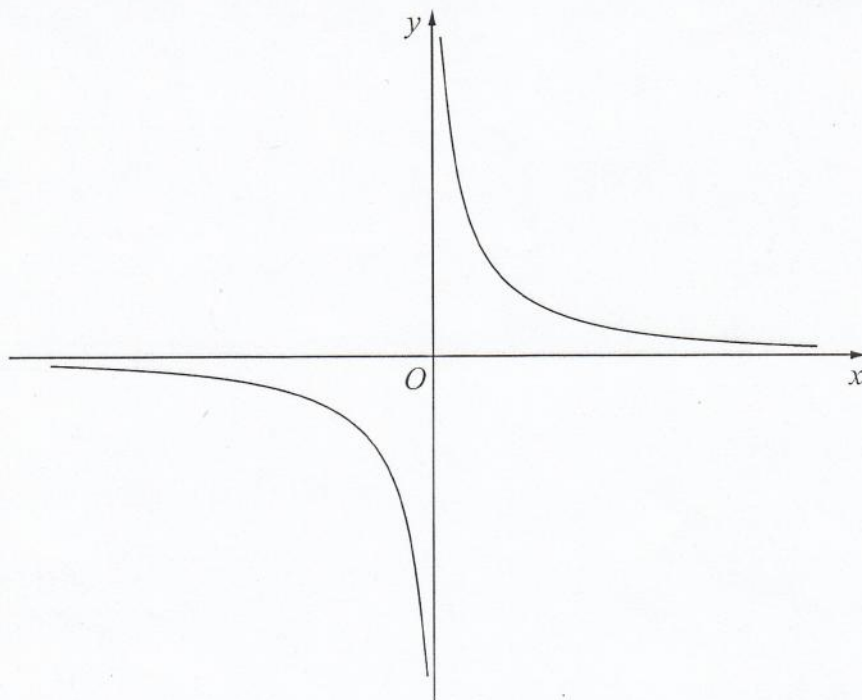


Figure 1

Figure 1 shows a sketch of the curve with equation $y = \frac{2}{x}$, $x \neq 0$

The curve C has equation $y = \frac{2}{x} - 5$, $x \neq 0$, and the line l has equation $y = 4x + 2$

- (a) Sketch and clearly label the graphs of C and l on a single diagram.

On your diagram, show clearly the coordinates of the points where C and l cross the coordinate axes.

(5)

- (b) Write down the equations of the asymptotes of the curve C .

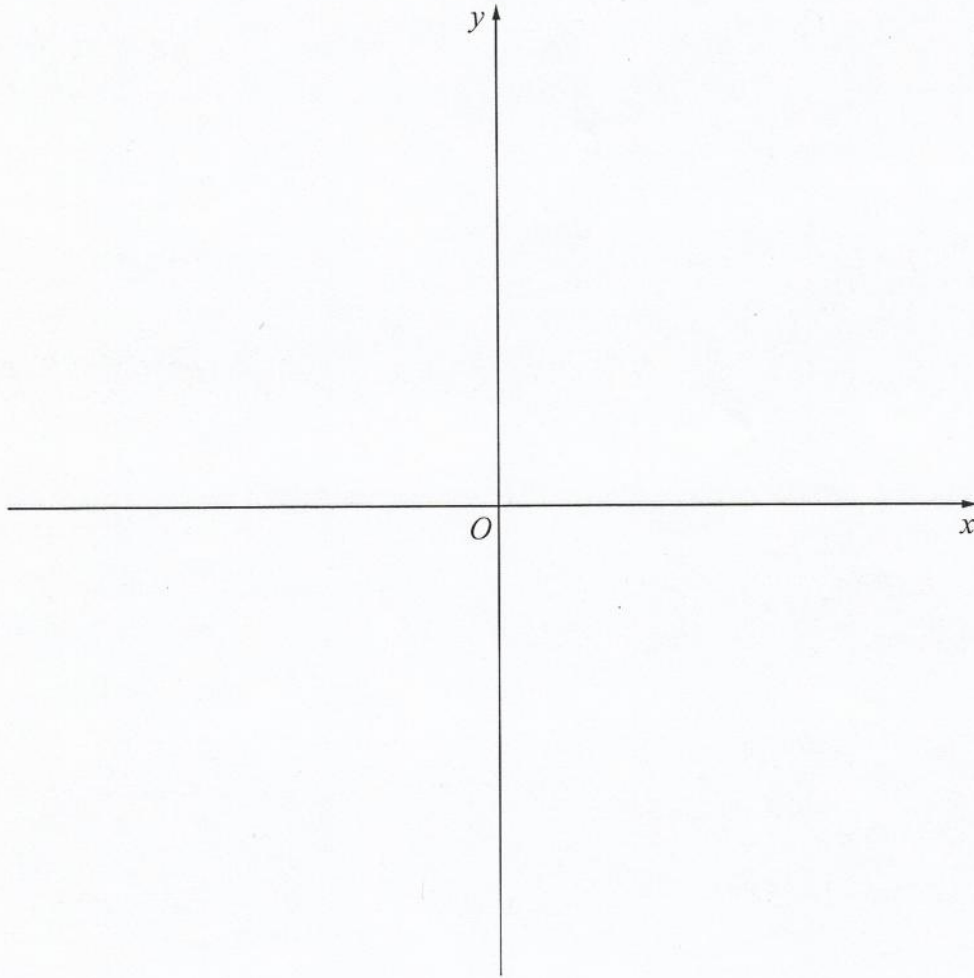
(2)

- (c) Find the coordinates of the points of intersection of $y = \frac{2}{x} - 5$ and $y = 4x + 2$

(5)



Question 10 continued



A series of 15 horizontal lines provided for writing the answer to the question.



8.

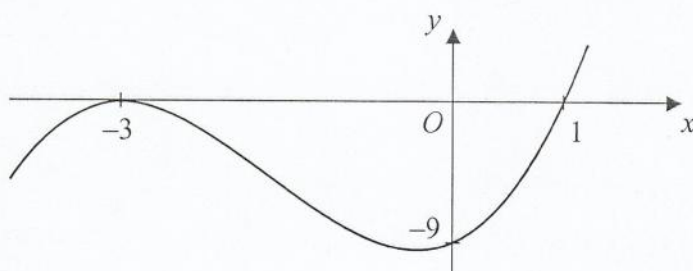


Figure 1

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

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

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)

