Graphs and Transformations - Edexcel Past Exam Questions

1.

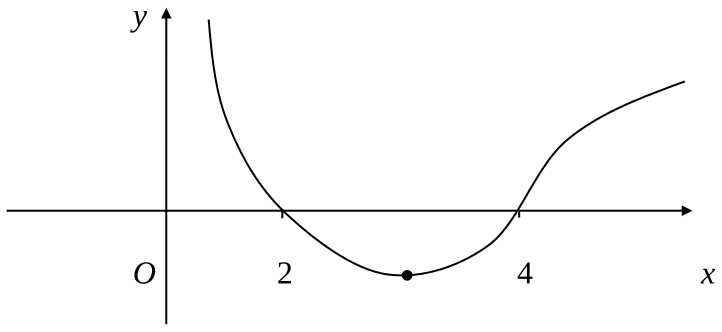

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (2, 0) and (4, 0). The minimum point on the curve is $P(3, -2)$.

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.

Jan 05 Q6

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2. 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)

June 06 Q9

3.

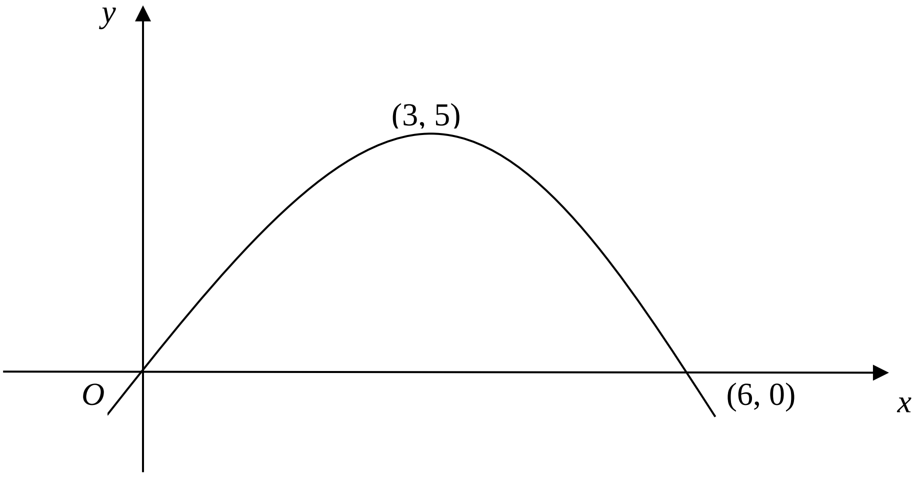

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve passes through the origin O and through the point (6, 0). The maximum point on the curve is (3, 5).

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.

June 05 Q4

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4. 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.

June 06 Q3

5.

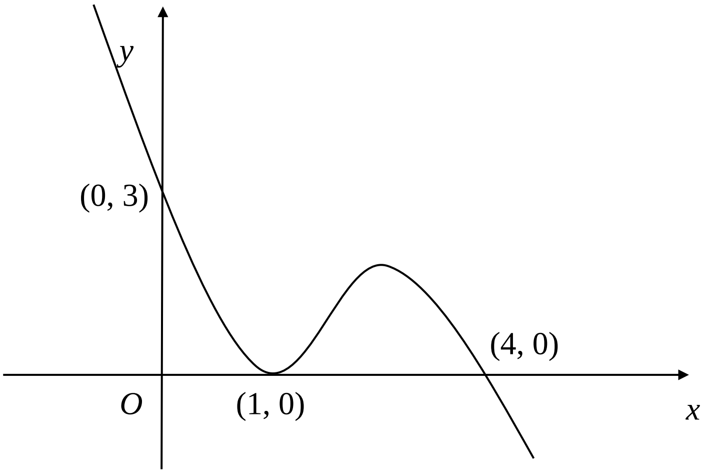

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points (0, 3) and (4, 0) and touches the x-axis at the point (1, 0).

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.

Jan 06 Q6

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6. 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)

Jan 07 Q3

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7. (*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)

Jan 07 Q10

8.

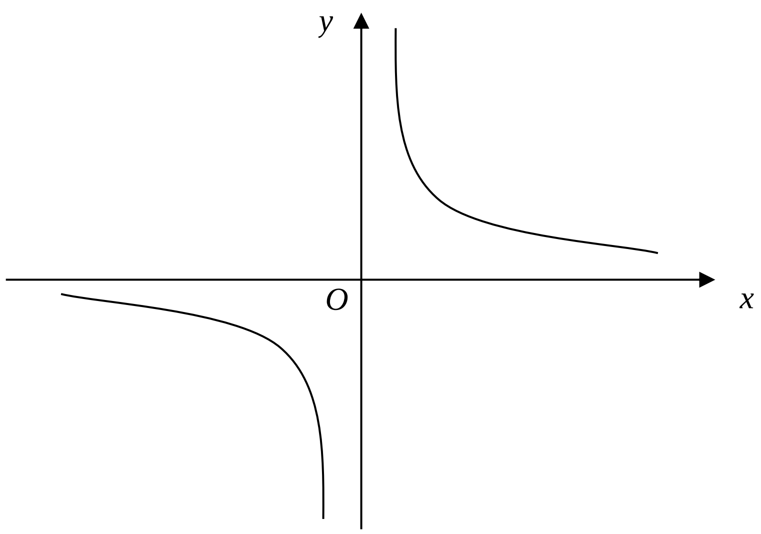

Figure 1

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

(*a*) On a separate diagram, sketch the curve with equation $y = \dfrac{3}{x+2}$, $x \neq -2$, 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)

June 07 Q5.

9.

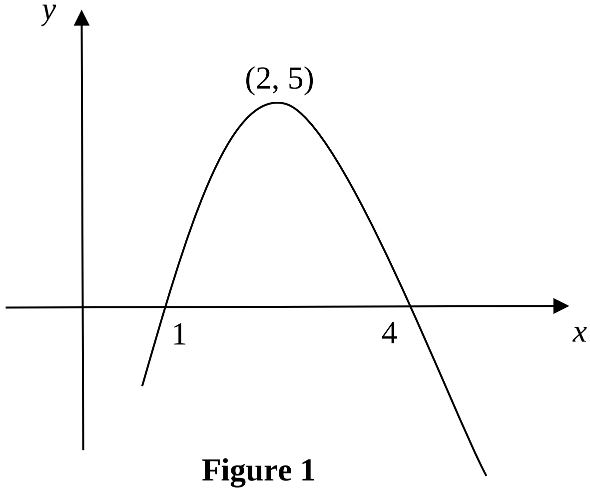

Figure 1

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)**

Jan 08 Q6

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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)

Jan 08 Q10 *(edited)*

11. The curve C has equation $y = \dfrac{3}{x}$ 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)

June 08 Q6

12.

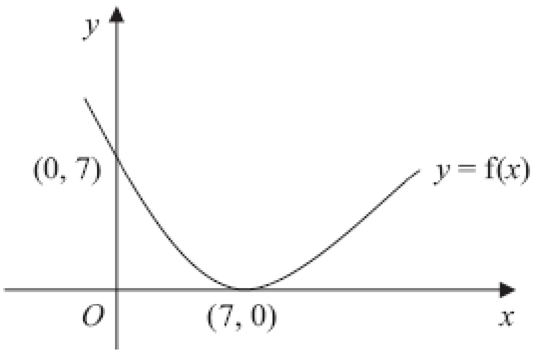

Figure 1

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.

June 08 Q3

13. 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) $y = \dfrac{2}{x}$.

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)

Jan 09 Q8

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14. (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)**

June 09 Q10

15.

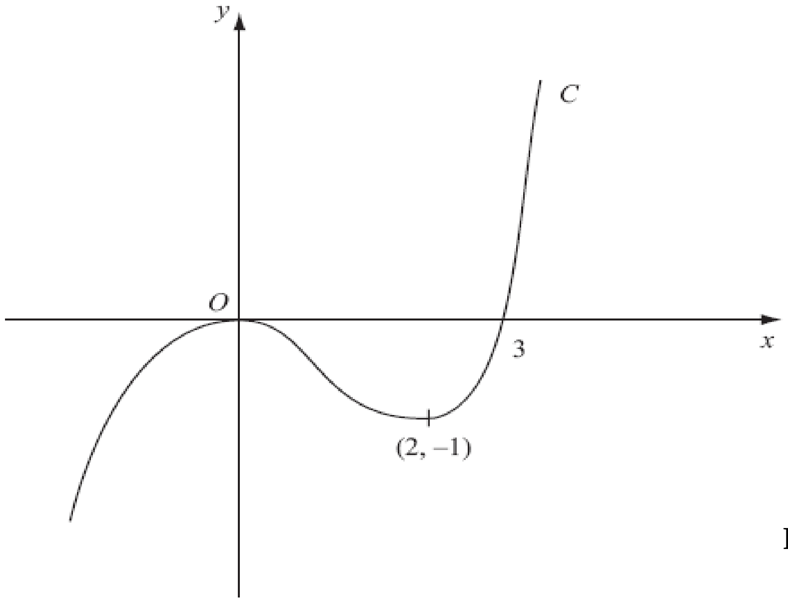

Figure 1

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.

Jan 09 Q5

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16. (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 axis.

(3)

Jan 10 Q9 *(edited)*

17.

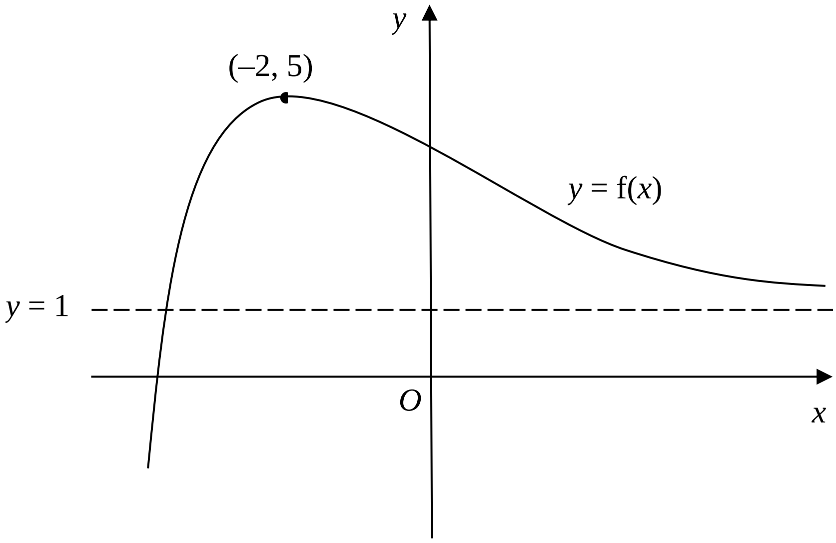

Figure 1

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.

Jan 10 Q8

18.

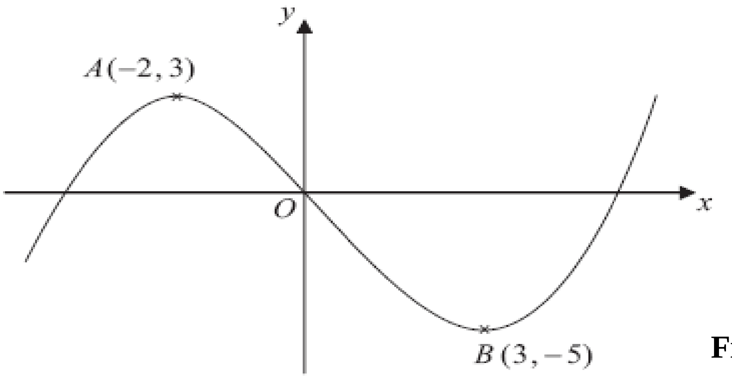

Figure 1

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

(3)

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

(3)

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

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

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

June 10 Q6

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19. (*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)

June 10 Q10

20.

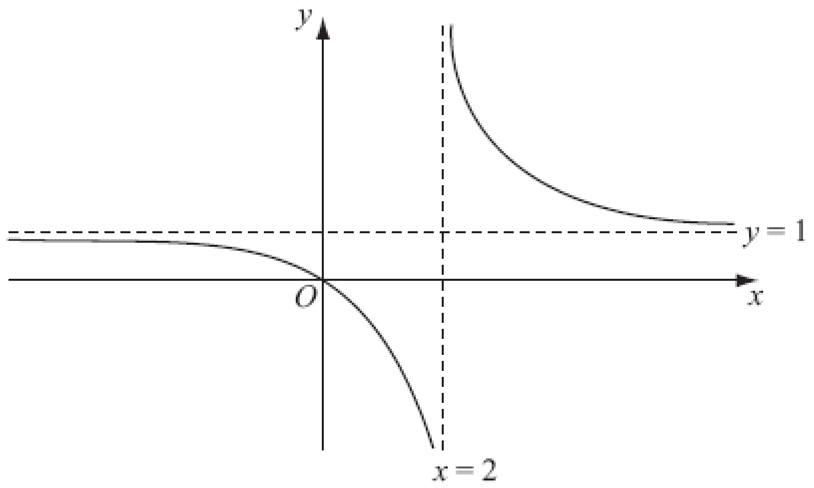

Figure 1

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)

Jan 11 Q5

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21. (*a*) Sketch the graphs of

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

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

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)

Jan 11 Q10

22.

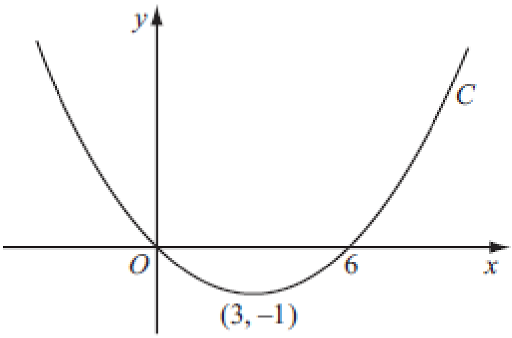

Figure 1

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.

June 11 Q8