Transformations - Past Edexcel Exam Questions

1. .

Figure 1:

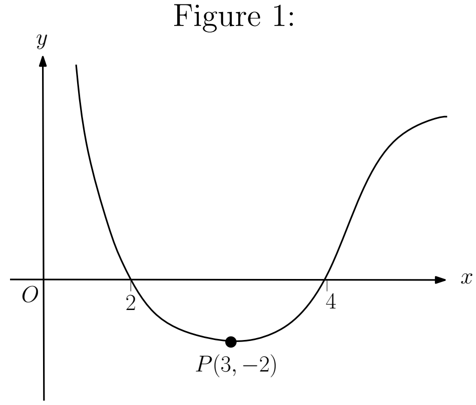


Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (2,0) and (4,0). The minimum point on the curve is $P(3, -2)$.

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.

. **Question 6 - Jan 2005**

2. Figure 2 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

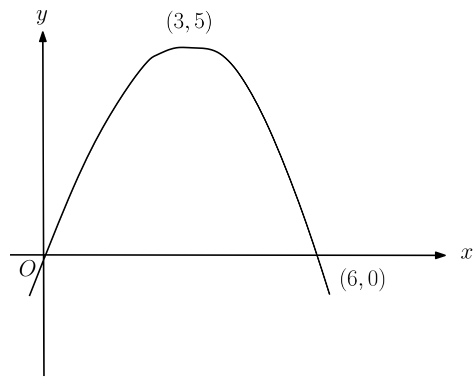
(a) $y = 3f(x)$ [2]

(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.

. **Question 4 - May 2005**

Figure 2:



3. .

Figure 3:

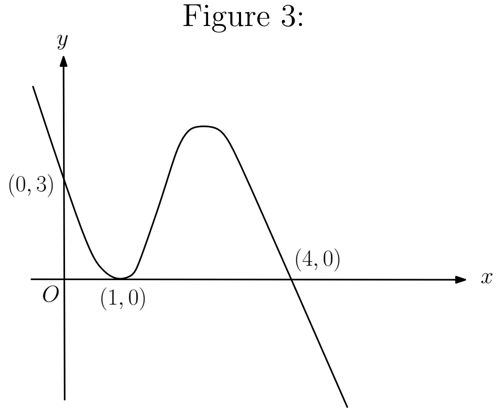


Figure 3 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points (0,3) and (4,0) and touches the x-axis at the point (1,0).

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.

. **Question 6 - Jan 2006**

4. Given that

$$f(x) = \frac{1}{x}, \qquad x \neq 0$$

(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 axes.
. [2]

Question 3 - Jan 2007

5. .

Figure 4:

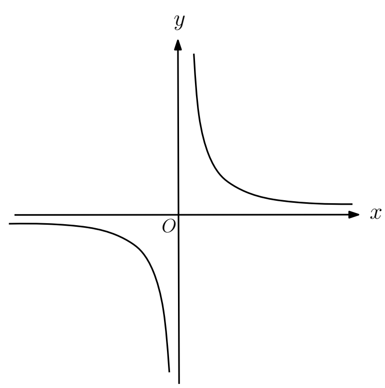


Figure 4 shows a sketch of the curve with equation $y = \frac{3}{x}$, $x \neq 0$.

(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]

Question 5 - May 2007

6\. .

Figure 5:

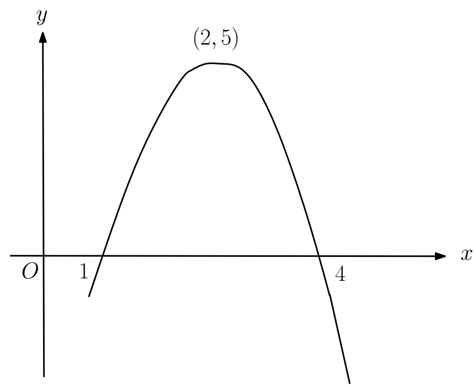


Figure 5 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (1,0) and (4,0). The maximum point on the curve is (2,5).

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]

Question 6 - Jan 2008

7\. Figure 6 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the point (0,7) and has a minimum at (7,0).

On separate diagrams, sketch the curve with equation

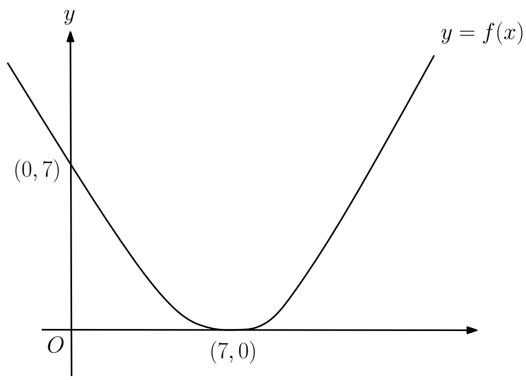
(a) $y = f(x) + 3$, [3]

(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.

. **Question 3 - Jun 2008**

Figure 6:



8. 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]

Question 6 - Jun 2008

9. .

Figure 7:

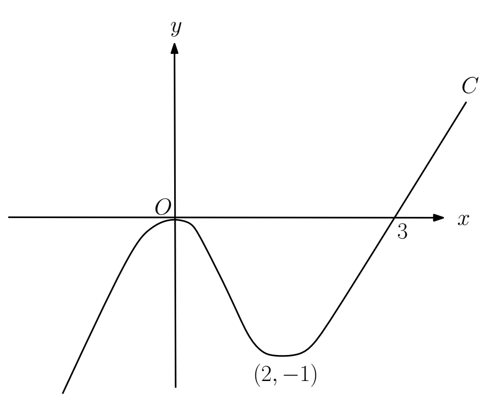


Figure 7 shows a sketch of the curve C with equation $y = f(x)$. There is a maximum at (0,0), a minimum at (2,-1) and C passes through (3,0).

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 - Jan 2009**

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10. .

Figure 8:

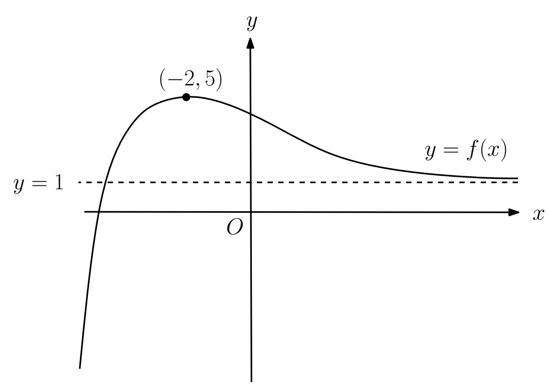

Figure 8 shows a sketch of part of the curve with equation $y = f(x)$.

The curve has a maximum point (-2,5) and an asymptote $y = 1$, as shown in Figure 8.

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 8 - Jan 2010**

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11. .

Figure 9:

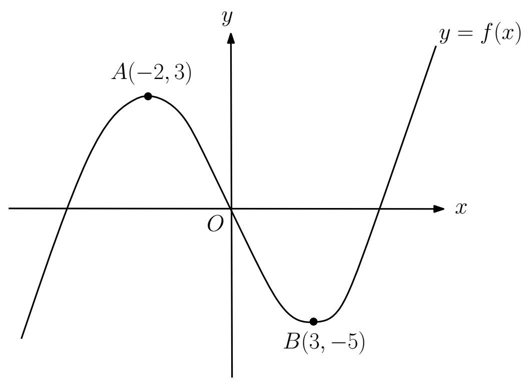


Figure 9 shows a sketch of the curve with equation $y = f(x)$. The curve has a maximum point A at (-2,3) and a minimum point at (3,-5).

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.

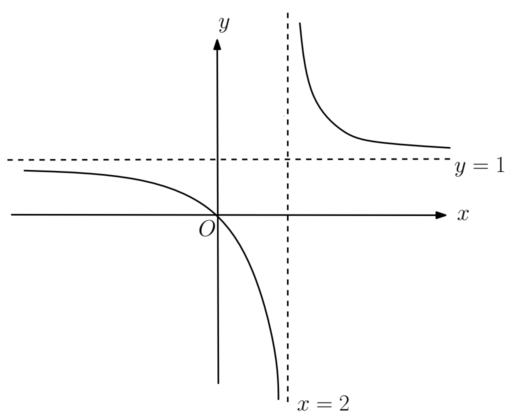
(c) Write down the value of a. [1]

Question 6 - May 2010

12. Figure 10 shows a sketch of the curve with equation $y = f(x)$ where

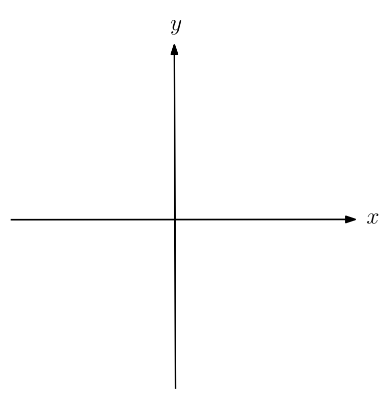
$$f(x) = \frac{x}{x-2}, \qquad x \neq 2$$

Figure 10:



The curve passes through the origin and has two asymptotes, with equation $y = 1$ 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]



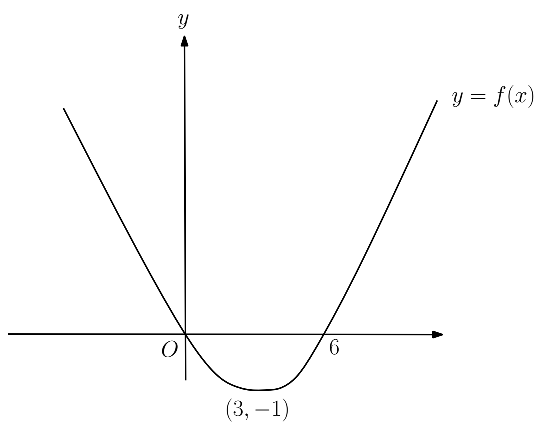
(b) Find the coordinates of the points where the curve with equation $y = f(x-1)$ crosses the coordinate axes. [4]

. **Question 5 - Jan 2011**

13. Figure 11 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).

Figure 11:



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.
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Question 8 - May 2011

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14. Figure 12 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]

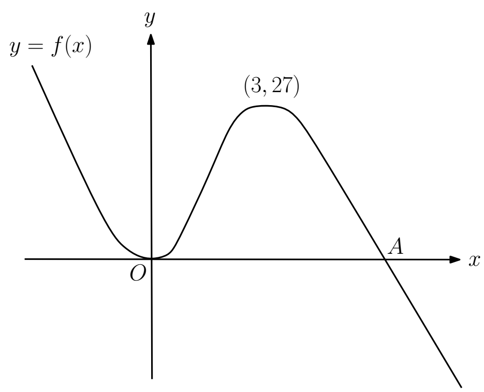
(b) On separate diagrams sketch the curve with equation

i. $y = f(x + 3)$,

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

On each sketch you should indicate clearly the coordinates of the maximum points and any points where the curves cross or meet the coordinate axes. [6]

Figure 12:



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]

Question 10 - May 2012

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15. .

Figure 13:

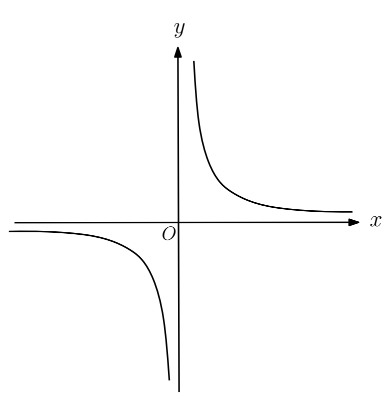

Figure 13 shows a sketch of the curve with equation $y = \frac{2}{x}$, $x \neq 0$.

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 6 - Jan 2013

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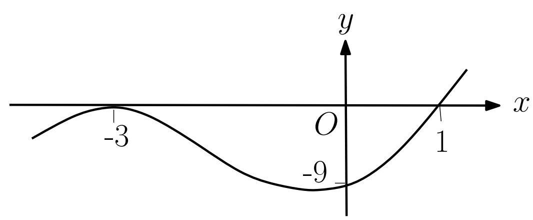
16. Figure 14 shows a sketch of the curve with equation $y = f(x)$ where

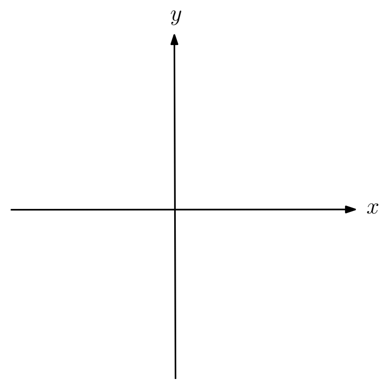
$$f(x) = (x+3)^2(x-1), \quad x \in \mathbb{R}$$

Figure 14:



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]

Question 8 - May 2013

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17. .

Figure 15:

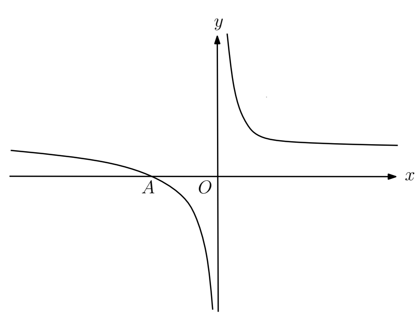


Figure 1 shows a sketch of the curve C with equation

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

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

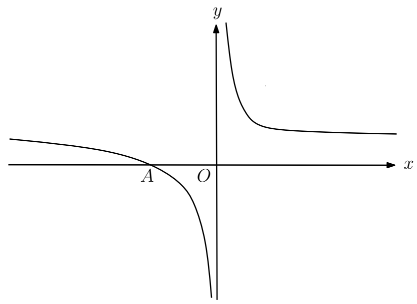
(a) State the x coordinate of the point A. [1]

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

(b) A copy of Figure 1 is shown below.

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

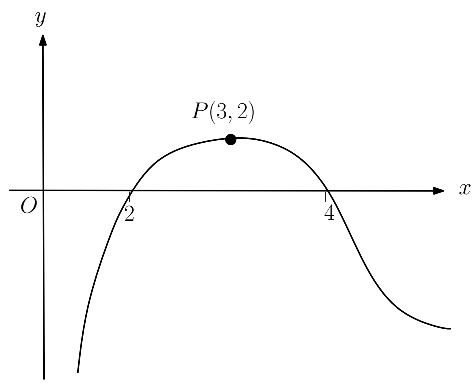
$$x^2(x-2) = \frac{1}{x} + 1$$

[1]

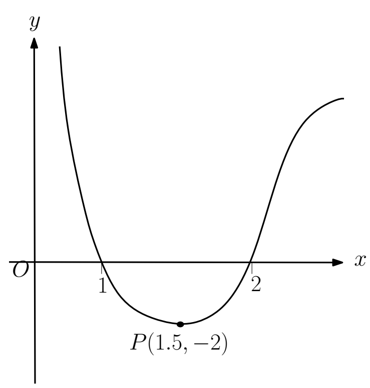
Question 4 - May 2014

Solutions

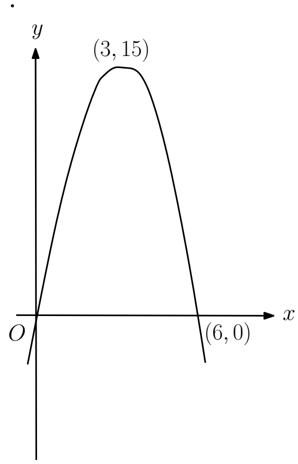
1. (a) .



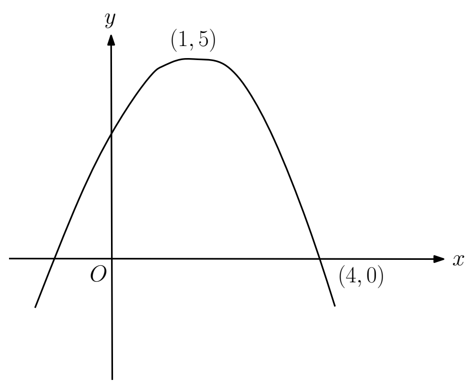
(b) .



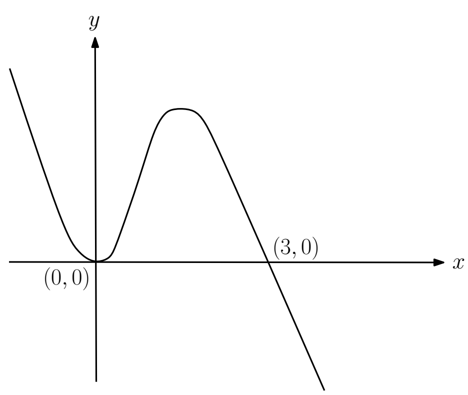
2. (a) .



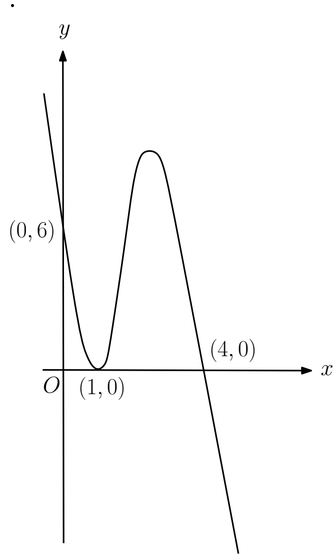
(b) .



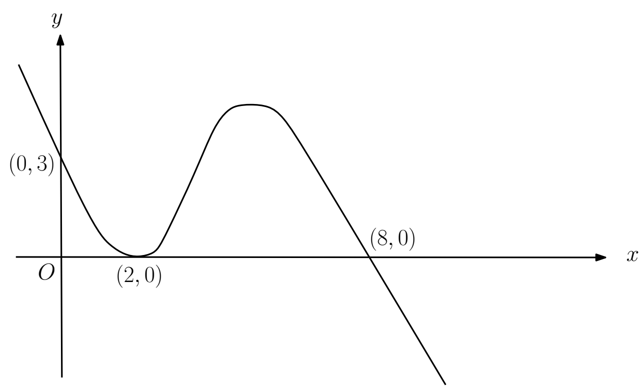
3. (a) .



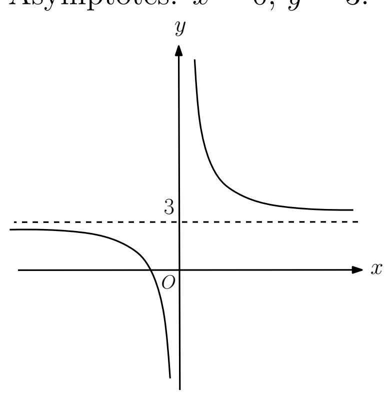
(b) .



(c) .

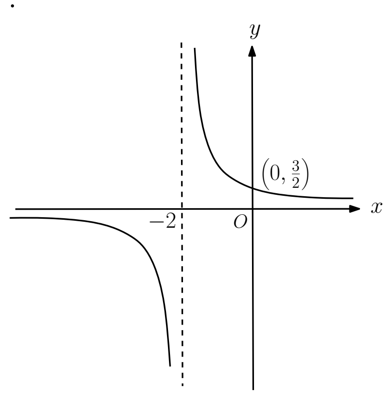


4. (a) Asymptotes: $x = 0$, $y = 3$.



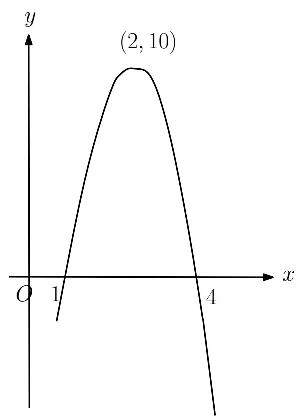
(b) $\left(-\frac{1}{3}, 0\right)$

5. (a) .

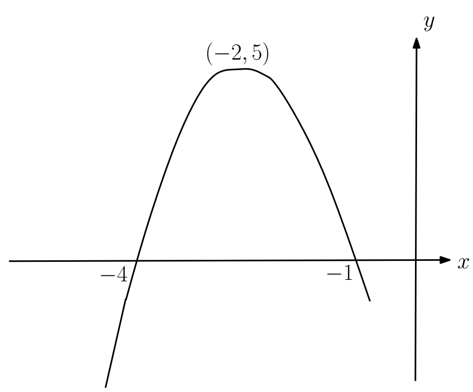


(b) Asymptotes: $x = -2$, $y = 0$

6. (a) .

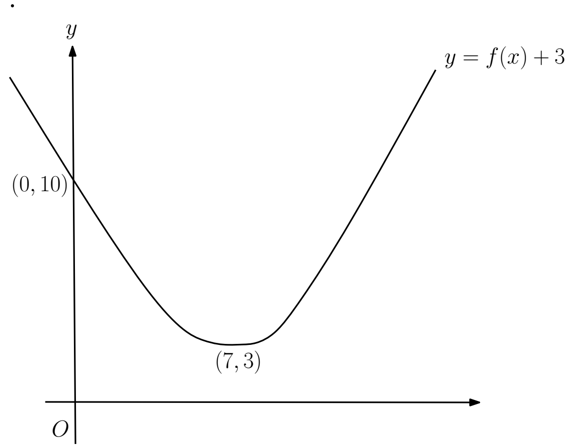


(b) .

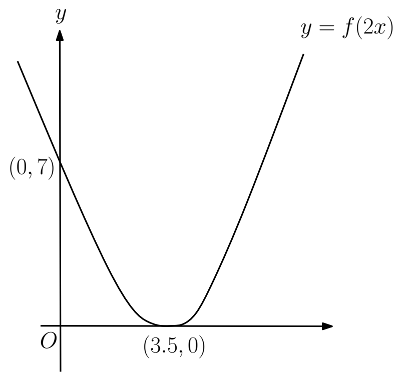


(c) $a = 2$

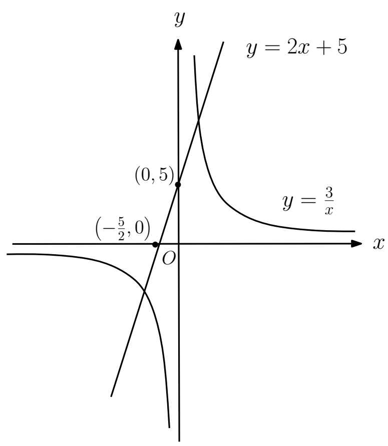
7. (a) .



(b) .

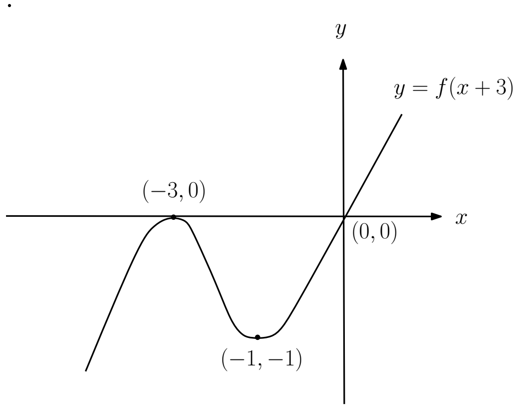


8. (a) .

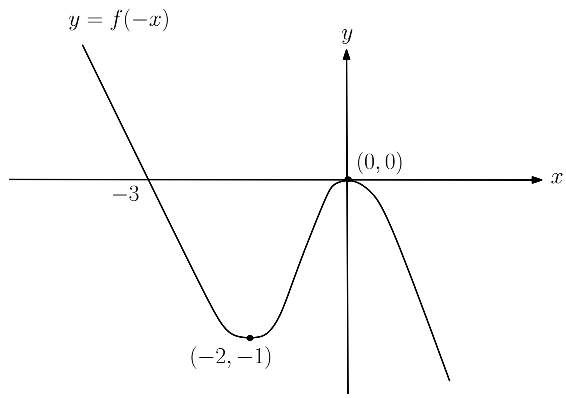


(b) $\left(\frac{1}{2}, 6\right)$, $(-3, -1)$

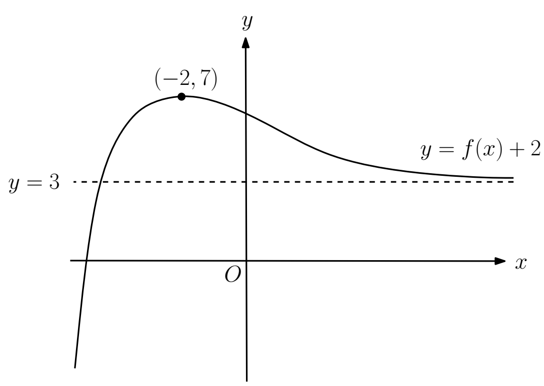
9. (a) .



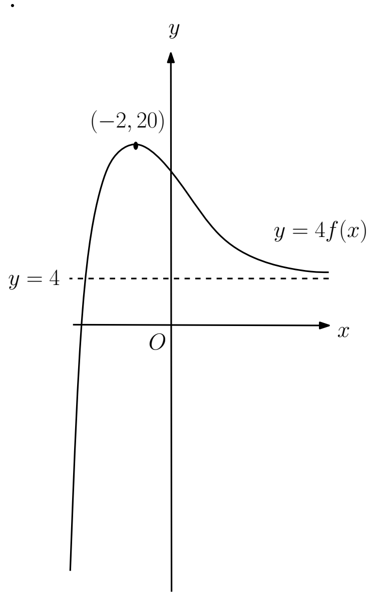
(b) .



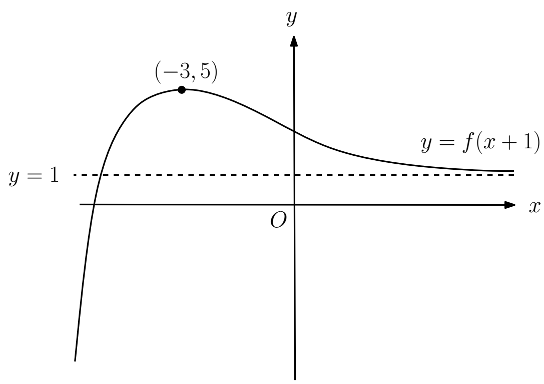
10. (a) .



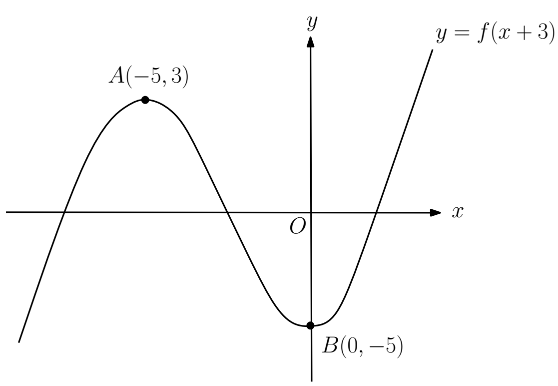
(b) .



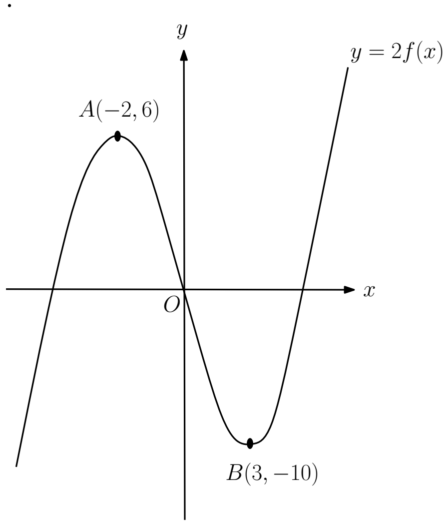
(c) .



11. (a) .

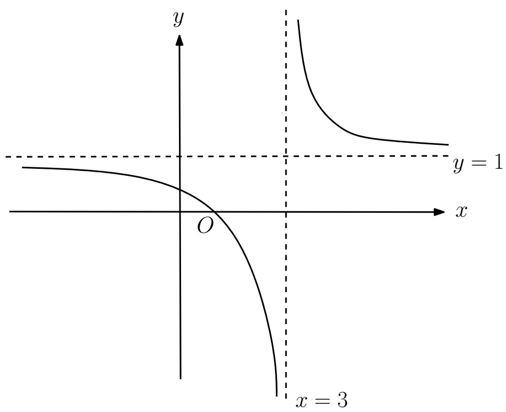


(b) .



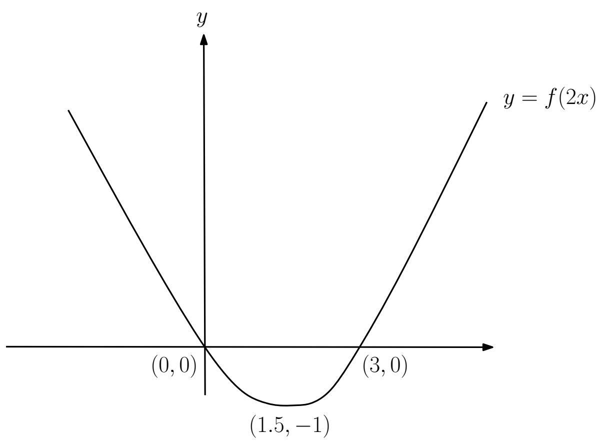
(c) $a = 5$.

12. (a) .

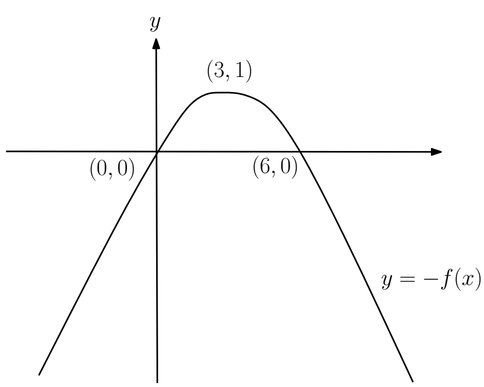


(b) $\left(\frac{1}{3}, 0\right)$

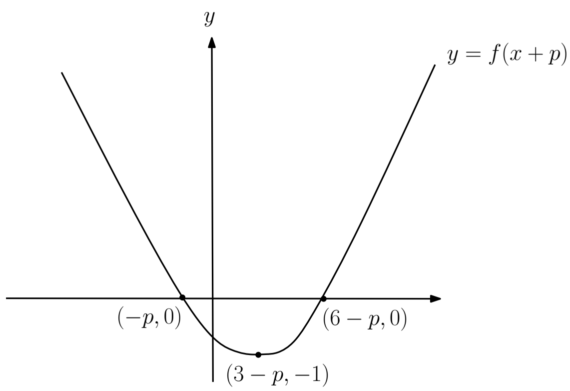
13. (a) .



(b) .

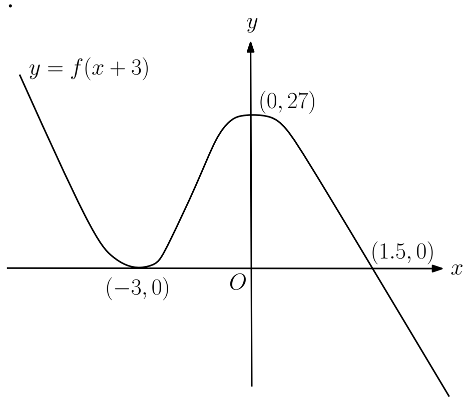


(c) .

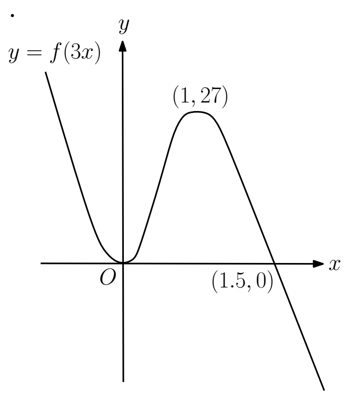


14. (a) $x = \frac{9}{2}$

(b) i. .

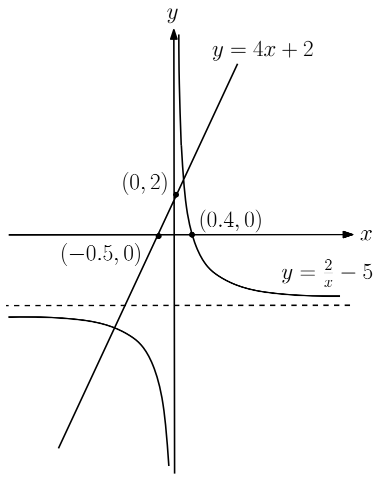


ii. .



(c) $k = -17$.

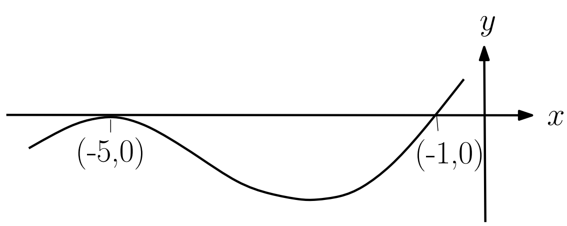
15. (a) .



(b) $x = 0$, $y = -5$

(c) $\left(\frac{1}{4}, 3\right)$, $(-2, -6)$

16. (a) .

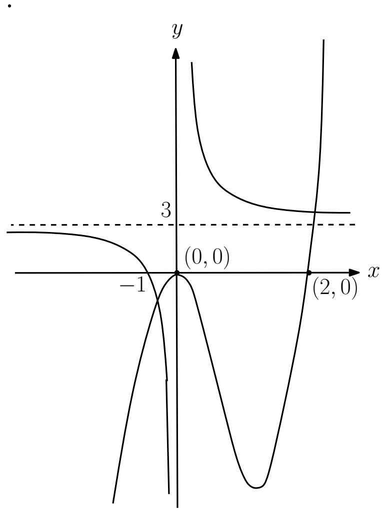


(b) $(x + 5)^2(x + 1)$

(c) $(0, 25)$

17. (a) $x = -1$

(b) .



(c) There are 2 solutions since the graphs intersect twice.