IB Questionbank Mathematical Studies 3rd edition

functions mappings and quadratics

64 min
96 marks

1. (a) Consider the numbers 2, $\sqrt{3}$, $-\frac{2}{3}$ and the sets $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, and $\mathbb{R}$.

Complete the table below by placing a tick in the appropriate box if the number is an element of the set, and a cross if it is not.

		$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R}$
(i)	2				
(ii)	$\sqrt{3}$				
(iii)	$-\frac{2}{3}$				

(3)

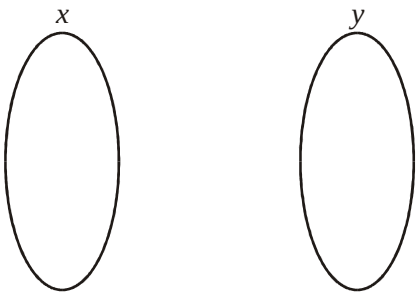
(b) A function f is given by $f : x \to 2x^2 - 3x$, $x \in \{-2, 2, 3\}$.

(i) Draw a mapping diagram to illustrate this function.

(ii) Write down the range of function f.

(3)
(Total 6 marks)

2. (a) Represent the function $y = 2x^2 - 5$, where $x \in \{-2, -1, 0, 1, 2, 3\}$ by a mapping diagram.



(b) List the elements of the domain of this function.

(c) List the elements of the range of this function.

(Total 6 marks)

3. Given the function $f(x) = 2 \times 3^x$ for $-2 \leq x \leq 5$,

(a) find the range of f;

(4)

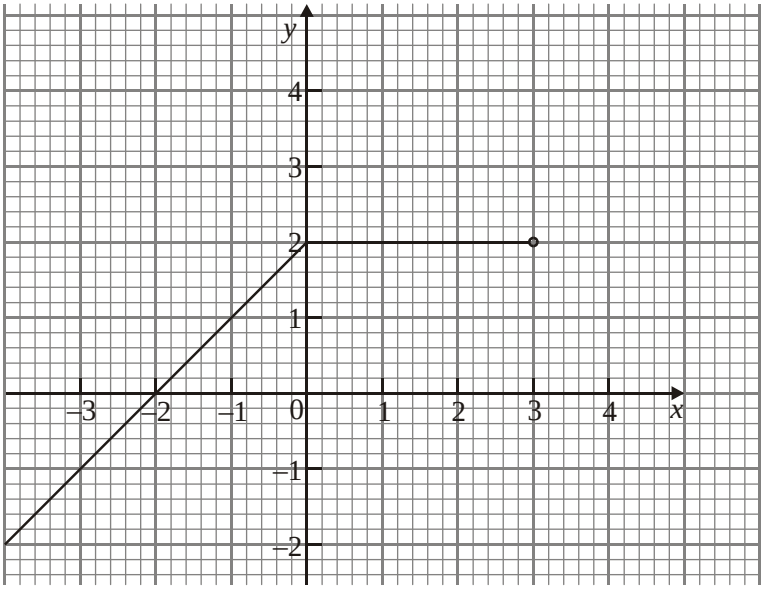
(b) find the value of x given that $f(x) = 162$.

(2)

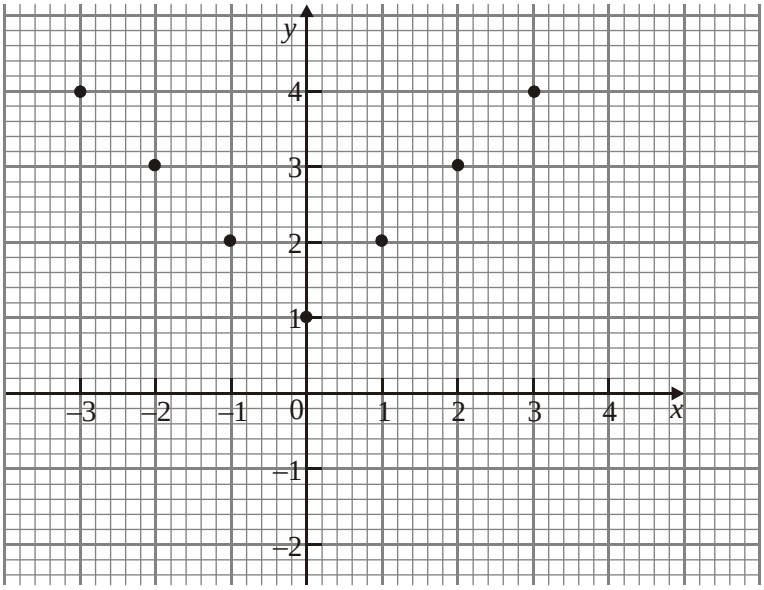
(Total 6 marks)

4. Write down the domain and range of the following functions.

(a)

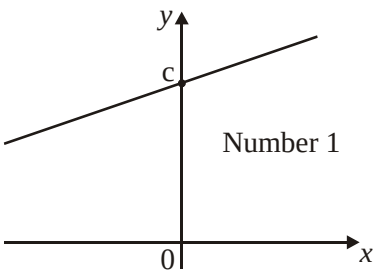


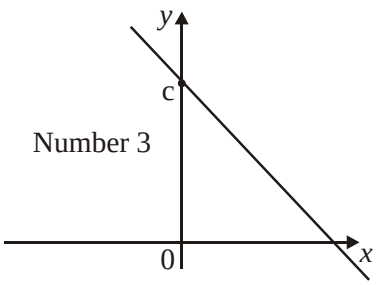
(b)

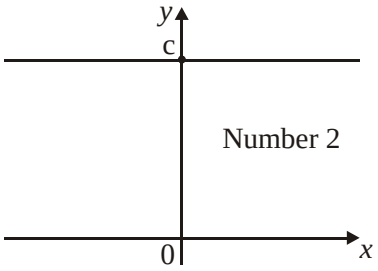


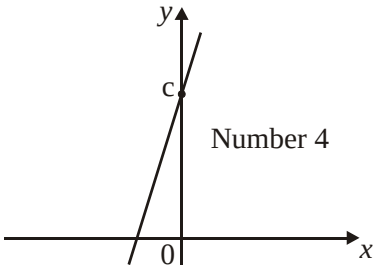
(Total 8 marks)

5. The four diagrams below show the graphs of four different straight lines, all drawn to the same scale. Each diagram is numbered and c is a positive constant.









In the table below, write the number of the diagram whose straight line corresponds to the equation in the table.

Equation	Diagram number
$y = c$	
$y = -x + c$	
$y = 3x + c$	
$y = \frac{1}{3}x + c$	

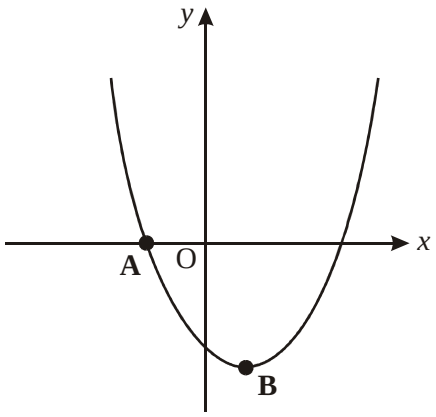
(Total 8 marks)

6. (a) Solve the equation $x^2 - 5x + 6 = 0$.

(b) Find the coordinates of the points where the graph of $y = x^2 - 5x + 6$ intersects the x-axis.

(Total 4 marks)

7. The diagram shows the graph of $y = x^2 - 2x - 8$. The graph crosses the x-axis at the point A, and has a vertex at B.



(a) Factorize $x^2 - 2x - 8$.

(b) Write down the coordinates of each of these points

(i) A;

(ii) B.

(Total 4 marks)

8. Consider the graphs of the following functions.

(i) $y = 7x + x^2$;

(ii) $y = (x - 2)(x + 3)$;

(iii) $y = 3x^2 - 2x + 5$;

(iv) $y = 5 - 3x - 2x^2$.

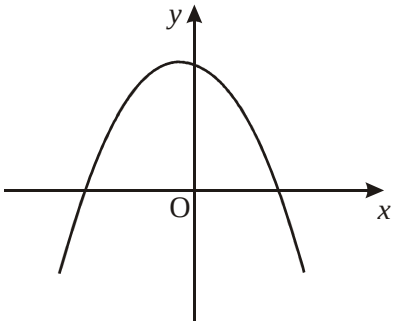
Which of these graphs

(a) has a y-intercept below the x-axis?

(b) passes through the origin?

(c) does not cross the x-axis?

(d) could be represented by the following diagram?



(Total 8 marks)

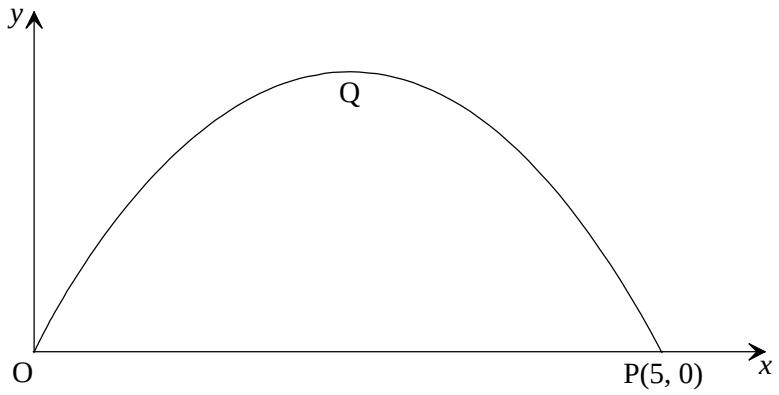
9. (a) Sketch the graph of the function $y = 2x^2 - 6x + 5$.

(b) Write down the coordinates of the local maximum or minimum of the function.

(c) Find the equation of the axis of symmetry of the function.

(Total 6 marks)

10. The diagram below shows the graph of $y = c + kx - x^2$, where k and c are constants.

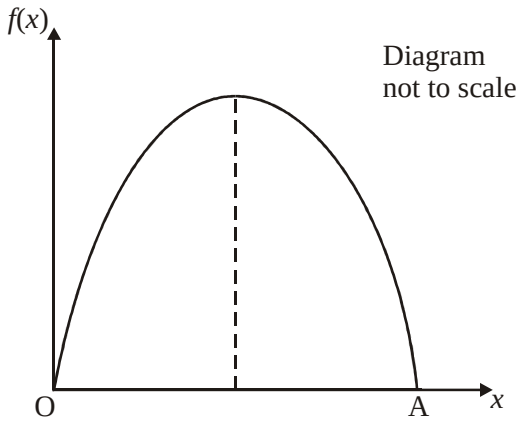


(a) Find the values of k and c.

(b) Find the coordinates of Q, the highest point on the graph.

(Total 8 marks)

11. The graph of the function $f : x \alpha 30x - 5x^2$ is given in the diagram below.



(a) Factorize fully $30x - 5x^2$.

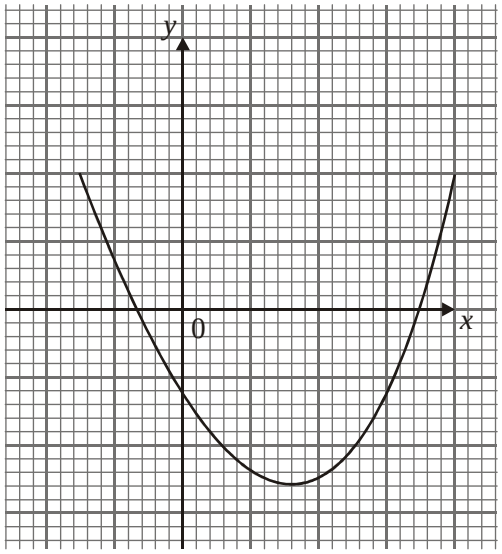
(b) Find the coordinates of the point A.

(c) Write down the equation of the axis of symmetry.

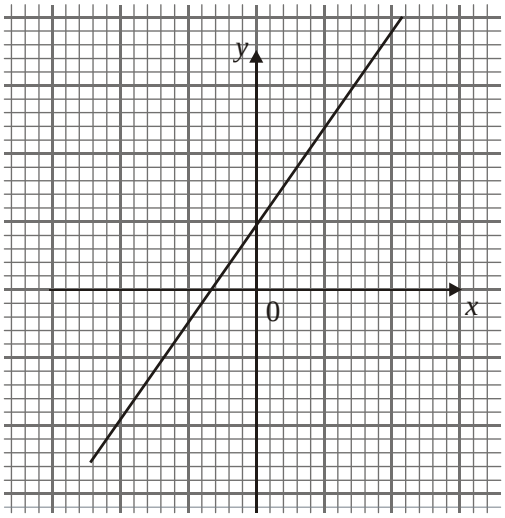
(Total 8 marks)

12. The diagrams below include sketches of the graphs of the following equations where a and b are **positive** integers.

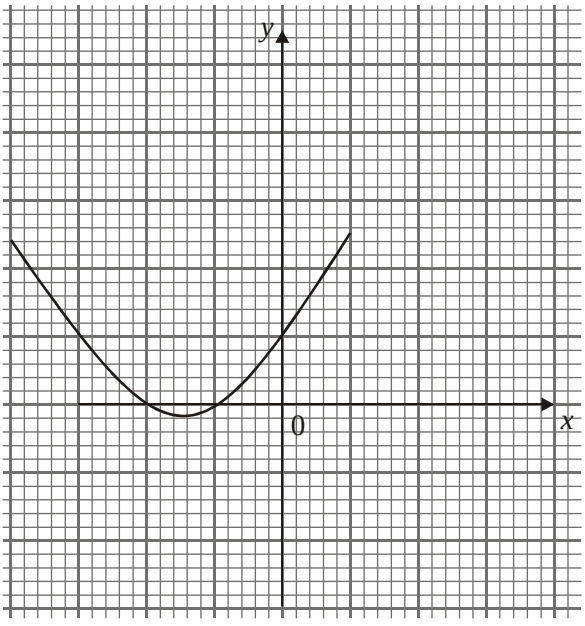
1.



2.



3.



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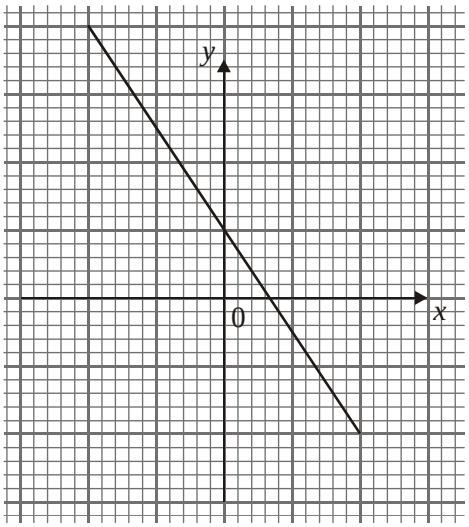
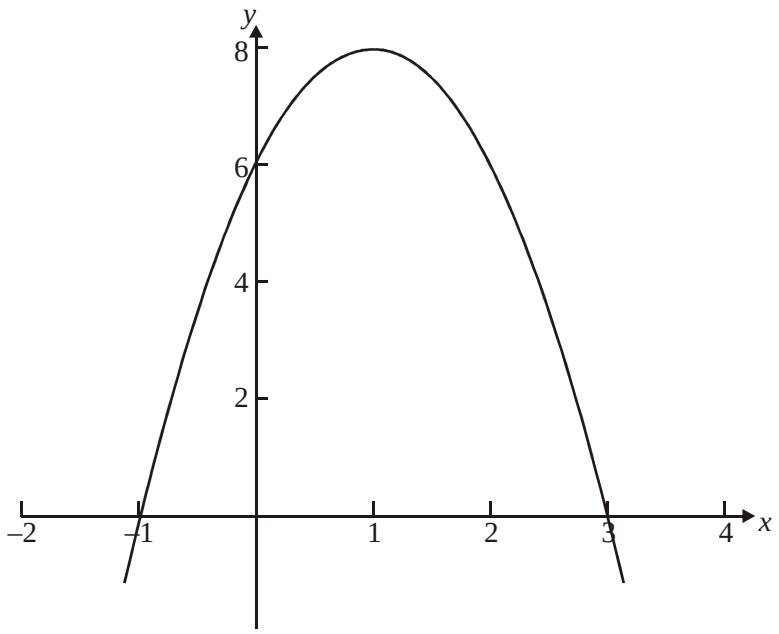


Complete the table to match each **equation** to the correct **sketch**.

	Equation	Sketch
(i)	$y = ax + b$	
(ii)	$y = -ax + b$	
(iii)	$y = x^2 + ax + b$	
(iv)	$y = x^2 - ax - b$	

(Total 8 marks)

13. The figure below shows part of the graph of a quadratic function $y = ax^2 + 4x + c$.



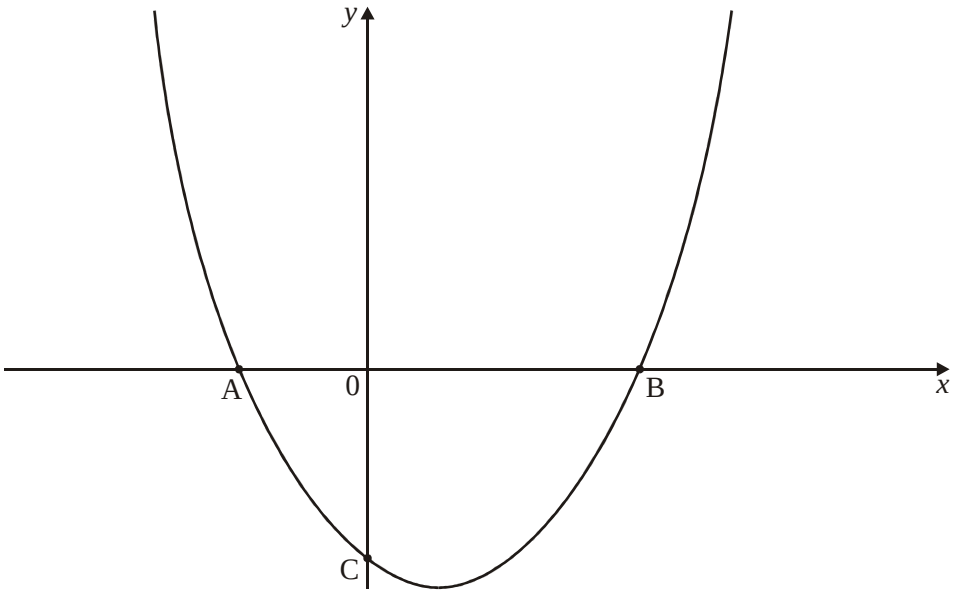
(a) Write down the value of c.

(b) Find the value of a.

(c) Write the quadratic function in its factorized form.

(Total 8 marks)

14. The graph of the function $y = x^2 - x - 2$ is drawn below.



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

(b) Calculate the coordinates of the points A and B.

(Total 8 marks)