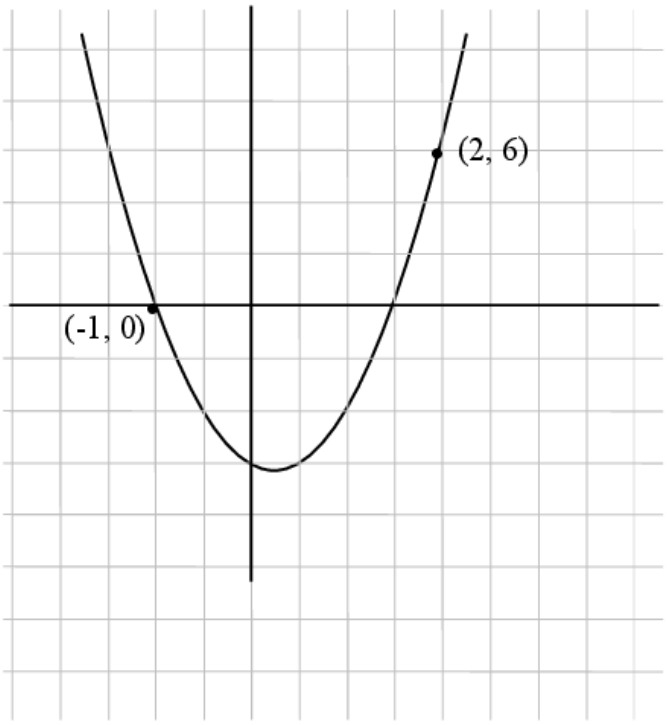
Question 1

(c) Let f be the function $f: x \to 4x^2 + bx + c$, $x \in \mathbf{R}$ and $b, c \in \mathbf{Z}$.

The points (2, 6) and (-1, 0) lie on the graph of f, as shown in the diagram.



(i) Find the value of b and the value of c.

(ii) Solve $f(x) = -6$.

Question 2

(b) **(i)** Let f be the function $f: x \to 5x - 4$ and g be the function $g: x \to 3x + 1$.

✍ Using the same axes and scales, draw the graph of f

and the graph of g, for $0 \le x \le 3,\ x \in \mathbf{R}$.

(ii) From your graphs, write down the co-ordinates of the point of intersection of the two lines.

(c) Let f be the function $f: x \to 2x^2 + x - 15$.

(i) ✍ Draw the graph of f for $-4 \le x \le 3,\ x \in \mathbf{R}$.

(ii) ✍ Use your graph to find the minimum value of $f(x)$.

(iii) ✍ Use your graph to find the range of values of x for which $f(x) \ge 0$.

Question 3

(c) **(i)** Let f be the function $f: x \to 2x - 1$ and g be the function $g: x \to 4x - 4$.

✍ Using the same axes and scales, draw the graph of f

and the graph of g, for $0 \le x \le 2,\ x \in \mathbf{R}$.

(ii) From your graphs, write down the co-ordinates of the point of intersection of the two lines.

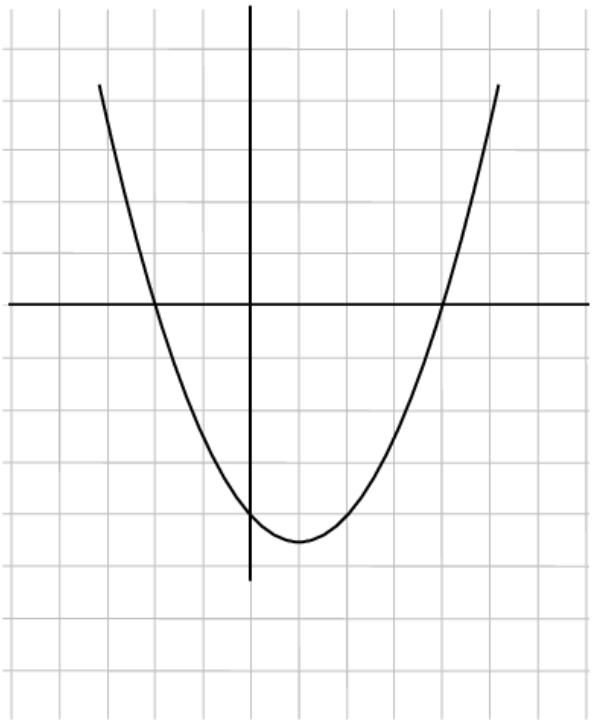
(iii) ✍ Check your answer to part **(ii)** by solving the simultaneous equations

$$y = 2x - 1$$
$$y = 4x - 4.$$

Question 4

(c) The diagram shows part of the graph of the function

$f : x \to x^2 + bx + c$, where $x \in \mathbf{R}$ and $b, c \in \mathbf{Z}$.



The graph intersects the x-axis at (-1, 0) and (2, 0).

(i) ✍ Calculate the value of b and the value of c.

(ii) ✍ $(k, -k+14)$ is a point on the graph, where $k \in \mathbf{Z}$.

Find the values of k.

Question 5

(c) Let f be the function $f : x \to 1 - 3x$ and g be the function $g : x \to 1 - x^2$.

(i) ✍ Find $f(-2)$ and $g(5)$.

(ii) ✍ Express $f(x + 1)$ in the form $ax + b$, a and $b \in \mathbf{Z}$.

(iii) ✍ Solve for x: $f(x + 1) = f(-2) + g(5)$.

Question 6

(b) Let f be the function $f: x \to 5 - 3x - 2x^2$ and g be the function $g: x \to -2x - 1$.

✍ Using the same axes and scales, draw the graph of f and the graph of g, for $-3 \le x \le 2$, $x \in \mathbf{R}$.

(c) Use your graphs from part **(b)** to estimate:

(i) ✍ the maximum value of $f(x)$

(ii) ✍ the values of x for which $f(x) = g(x)$

(iii) ✍ the range of values of x for which $f(x) \ge g(x)$.

Question 7

(c) Let f be the function $f: x \to x^2 + bx + c$, $x \in \mathbf{R}$ and $b, c \in \mathbf{Z}$.
The graph of f cuts the x axis at the points where $x = -3$ and $x = 2$.

(i) ✍ Find the value of b and the value of c.

(ii) ✍ Find the value of x for which $f(x) = f(x + 2)$.

Question 8

(b) Let f be the function $f: x \to x^2 + 5x$ and let g be the function $g: x \to x + 2$.

✍ Using the same axes and scales, draw the graph of f and the graph of g, for $-5 \le x \le 1$, $x \in \mathbf{R}$.

(c) Use your graphs from part **(b)** to estimate:

(i) ✍ The minimum value of $f(x)$

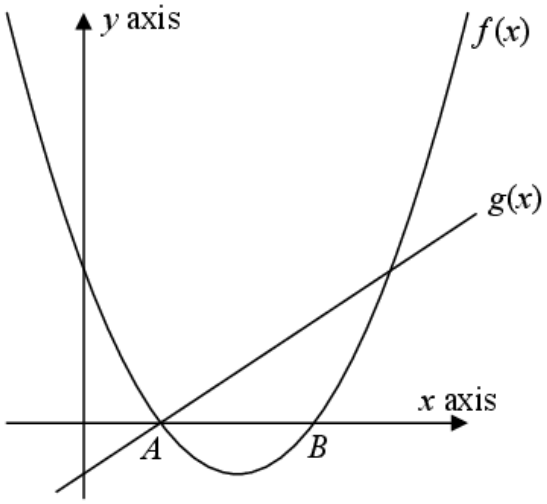
(ii) ✍ The values of x for which $f(x) = g(x)$

(iii) The range of values of x for which $f(x) \le g(x)$.

Question 9

(c) The diagram below shows part of the graphs of the functions

$$f(x) = x^2 - 4x + 3 \text{ and } g(x) = x + k.$$



The graph of $f(x)$ cuts the x axis at A and B.

The graphs of $f(x)$ and $g(x)$ intersect at A.

(i) ✍ Find the coordinates of A and the coordinates of B.

(ii) ✍ Find the value of k.

(iii) ✍ Verify that $f(x)$ and $g(x)$ intersect also at the point $(4, 3)$.

Question 10

(b) Let f be the function $f: x \to 7x - x^2$.

✍ Draw the graph of f for $0 \le x \le 7,\ x \in \mathbb{R}$.

(c) The formula for the height, y metres, of a golf ball above ground level x seconds after it is hit, is given by $7x - x^2$.

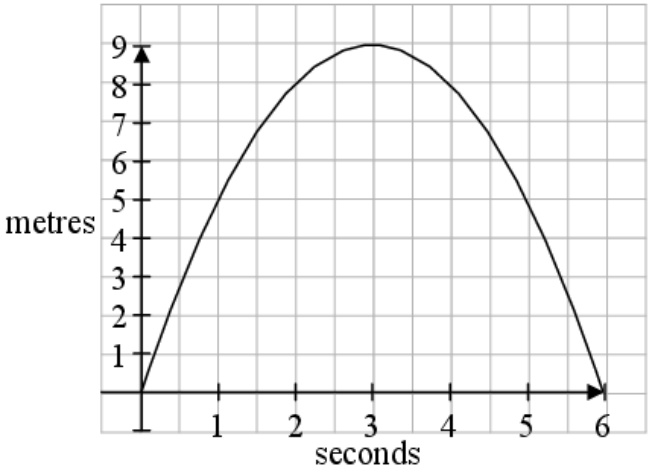
Use your graph from part **(b)**:

(i) ✍ to find the maximum height reached by the golf ball

(ii) ✍ to estimate the number of seconds the golf ball was more than 2 metres above the ground.

The graph below represents the flight of another golf ball.

The flight of the golf ball is given by the formula $ax - x^2,\ x \in \mathbb{R}$.



(iii) ✍ Find the value of a.