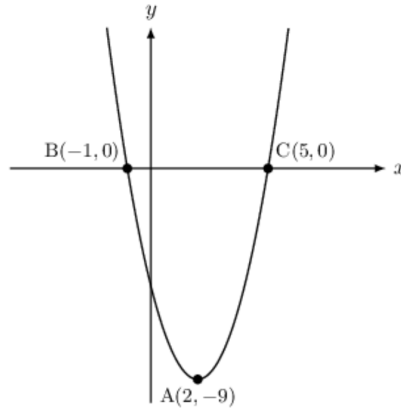# 1

The following diagram shows part of the graph of a quadratic function f.

The vertex is at point A and the x-intercepts are at points B and C.

The function f can be written in the form $f(x) = (x - h)^2 + k$.

(a) Write down the values of h and k. [2]

The function f can also be written in the form $f(x) = (x + p)(x - q)$.

(b) Write down the values of p and q. [2]

(c) Find the y-intercept of the graph of f. [2]

2

Let $f(x) = x^2 - 2x - 8$, for $x \in \mathbb{R}$.

(a) Write down the y-intercept of the graph of $y = f(x)$. [1]

(b) Solve the equation $f(x) = 0$. [3]

(c) Find the equation of the axis of symmetry of the graph of $y = f(x)$. [2]

3

Let $f(x) = (x - 3)(x + 1)$, for $x \in \mathbb{R}$.

For the graph of f, find:

(a) the y-intercept; [2]

(b) the x-intercepts; [2]

(c) the coordinates of the vertex. [3]

4

Let $f(x) = a(x - h)^2 + k$, for $x \in \mathbb{R}$.

The vertex of the graph of f is at P$(3, 4)$ and the graph passes through Q$(1, -4)$.

(a) Write down the values of h and k. [2]

(b) Find the value of a. [3]

5

The equation $x^2 + kx + 4 = 0$ has two equal roots.

Find the possible values of k.

6

Let $f(x) = x^2 - 4x + 3$, for $x \in \mathbb{R}$.

(a) For the graph of $y = f(x)$, find:

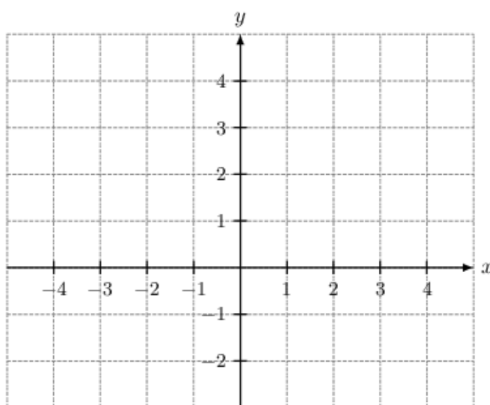   (i) the y-intercept;

    (ii) the x-intercepts. [3]

(b) The function f can be expressed in the form $f(x) = (x - h)^2 + k$. Find
the value of h and the value of k. [2]

(c) Sketch the graph of $y = f(x)$ on the grid below. Clearly label
the intercepts with the axes, and the vertex. [2]

7

The equation $x^2 - kx + 1 = 0$ has two distinct real roots.

Find the possible values of k.

8

(a) Express $2x^2 - 8x + 9$ in the form $a(x + b)^2 + c$ where $a, b, c \in \mathbb{Z}$. [2]

(b) Given that $f(x) = x - 2$ and $(g \circ f)(x) = 2x^2 - 8x + 9$, find $g(x)$. [3]

9

The equation $x^2 + (k - 3)x - 3k = 0$ has two distinct real solutions.

Find the possible values of k.

10

Consider $f(x) = x^2 + bx + c$, for $x \in \mathbb{R}$, where $b, c \in \mathbb{Z}$. The graph of f has a local minimum at $x = 2.5$. The distance
between the two x-intercepts of the graph of f is 7.

(a) Find the coordinates of the two x-intercepts. [2]

(b) Find the value of b and the value of c. [4]