CHAPTER 5
Quadratic Equations and Graphs

▶》 Key Notes

5.1 Solving Quadratic Equations by Factorisation

In order to solve quadratic equations by factorisation, the quadratic expression needs to equate to 0.
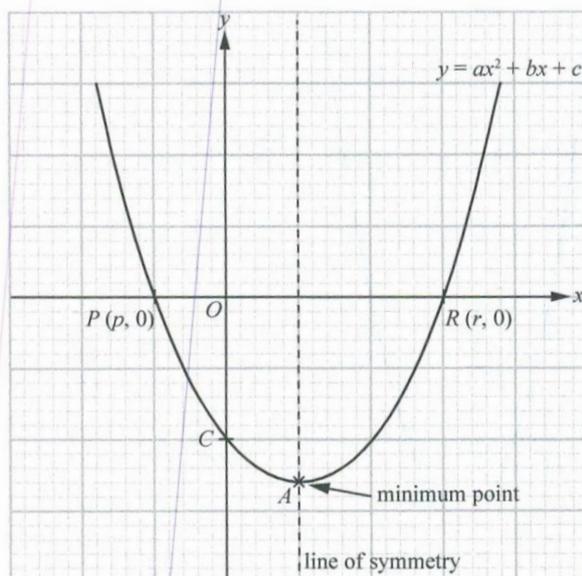
For example,
When $(ax + b)(cx + d) = 0$,

$$ax + b = 0 \qquad \text{or} \qquad cx + d = 0$$
$$x = -\frac{b}{a} \qquad\qquad\qquad x = -\frac{d}{c}$$

5.2 Graphs of Quadratic Functions

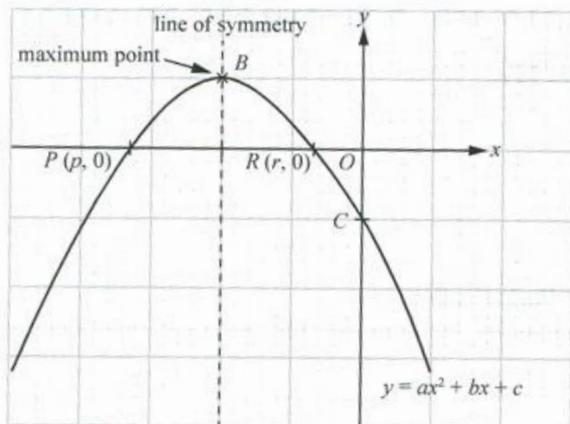The general form of a quadratic equation is $y = ax^2 + bx + c$. The graph of a quadratic function is a curve.

Note:
When $a > 0$, the curve opens upwards and is $\cup$-shaped.
- The y-intercept is at point C.
- The x-intercepts are at points P and R.
- The minimum point is at point A.
- The line of symmetry passes through the minimum point, i.e. $x = \frac{p + r}{2}$.

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Note:
When $a < 0$, the graph opens downwards and is $\cap$-shaped.
- The y-intercept is at point C.
- The x-intercepts are at points P and R.
- The maximum point is at point B.
- The line of symmetry passes through the maximum point, i.e. $x = \frac{p+r}{2}$.

5.3   Solving Quadratic Equations by Graphical Method

To solve $ax^2 + bx + c = k$, draw a line $y = k$ on the same graph as $y = ax + bx + c$. The x-coordinates of the intersection points are the solutions of the quadratic equation.

For example,
Using the graph below, solve $2x^2 - x - 1 = 5$.
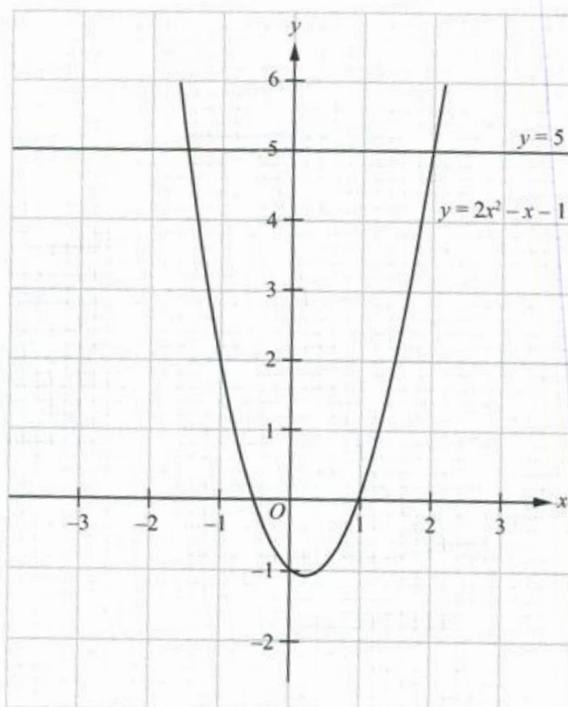
From the graph, the points of intersection of the line $y = 5$ and the curve $y = 2x^2 - x - 1$ are at $(2, 5)$ and $\left(-\frac{3}{2}, 5\right)$. Hence, the solutions for $2x^2 - x - 1 = 5$ are 2 and $-\frac{3}{2}$.