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Curved Graphs

IGCSE Mathematics

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Quality Mathematics Education for Students

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1 Introduction to Curved Graphs

Note

Curved graphs are central to IGCSE Mathematics. Unlike straight-line graphs, they model many real-world phenomena, including the path of a thrown ball, population growth, and the behaviour of electrical components.

In this chapter, we will explore:

- Quadratic graphs and their key features (parabolas)
- Reciprocal graphs and their asymptotes
- Graphical solutions of quadratic equations
- Other non-linear graphs: cubic and exponential
- Finding the gradient of a curve at a point
- Introduction to derivatives of functions

2 Quadratic Graphs

Definition

A **quadratic function** has the form:

$$y = ax^2 + bx + c \quad \text{where } a \neq 0$$

Its graph is a **parabola**, a smooth symmetrical curve.

- If $a > 0$: the parabola opens **upward** (U-shape), has a **minimum** point
- If $a < 0$: the parabola opens **downward** (n-shape), has a **maximum** point

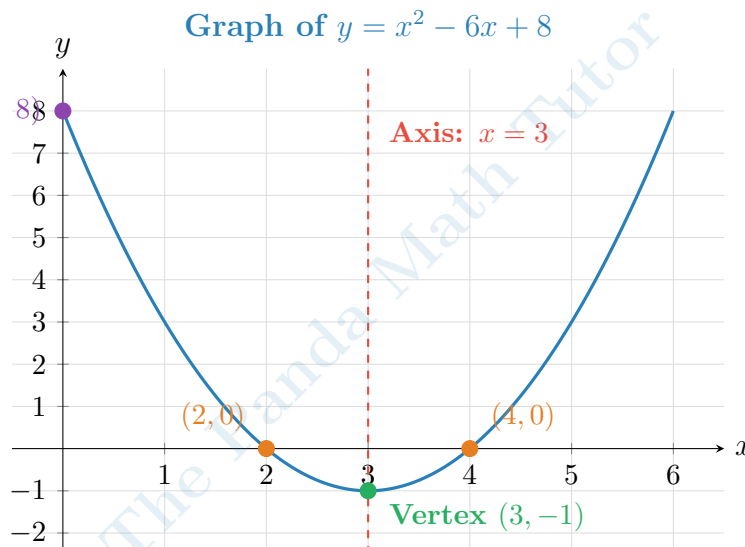
2.1 Key Features of a Parabola

Key Features of $y = ax^2 + bx + c$

- **Vertex (Turning Point):** The highest or lowest point of the parabola. Its x -coordinate is:

$$x = -\frac{b}{2a}$$

- **Axis of Symmetry:** The vertical line $x = -\frac{b}{2a}$
- **y -intercept:** Set $x = 0$; gives the point $(0, c)$
- **x -intercepts (roots):** Set $y = 0$ and solve $ax^2 + bx + c = 0$



Method

Drawing a Quadratic Graph

- Step 1:** Identify a , b , c and note the direction of the parabola ($a > 0$ or $a < 0$)
- Step 2:** Create a table of values for a suitable range of x
- Step 3:** Calculate each y value carefully (show all working)
- Step 4:** Plot the points accurately on a grid
- Step 5:** Join the points with a **smooth** curve (never with straight line segments!)
- Step 6:** Label the curve with its equation
- Step 7:** Mark and label the vertex, y -intercept, and x -intercepts clearly

Preview ends here

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