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Curved Graphs

IGCSE Mathematics

The Panda Math Tutor

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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

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2 Quadratic Graphs

Definition

A **quadratic function** has the form:

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

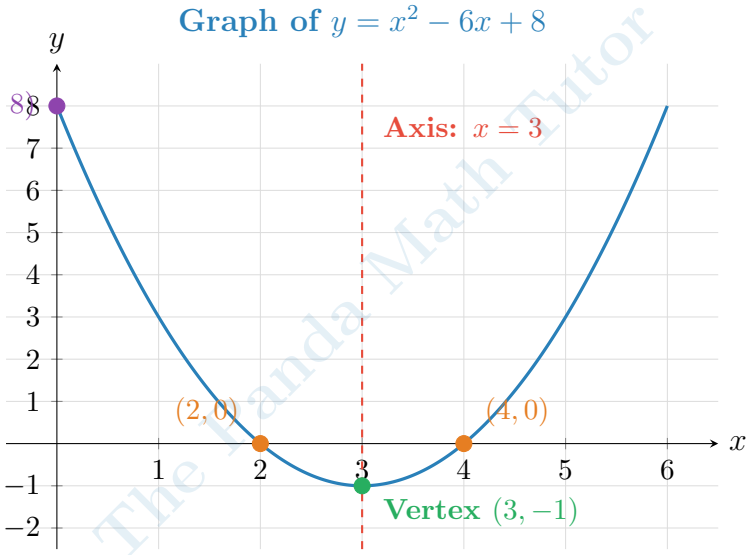
Its graph is a **parabola**, a smooth symmetrical curve.

- 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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