

C2.11 Sketching curves

Name: _____ Class: _____ Date: _____

Total: 20 marks**KEY WORDS** symmetry 对称 • intercept 截距 • quadratic 二次 • roots 根 • linear 一次

Objective

Use sketching curves to solve Core IGCSE Mathematics problems.

You must be able to:

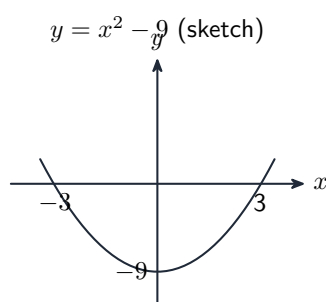
- Recognise and sketch linear and quadratic graphs
- Label roots, intercepts and quadratic symmetry
- Explain the difference between plotting and reading a sketch

1 Key knowledge and worked examples

■ Key knowledge: Sketching curves

A sketch shows the shape and important crossings rather than a full table. A linear graph is straight. A positive quadratic opens upwards; a negative quadratic opens downwards. Mark roots where $y = 0$ and the y -intercept where $x = 0$. A quadratic has a vertical line of symmetry halfway between its two roots. Core sketching does not require turning-point coordinates.

■ Worked example: Sketching curves

Sketch $y = x^2 - 9$.

- The positive x^2 term makes an upward curve.
- The roots satisfy $x^2 = 9$, so $x = -3, 3$.
- At $x = 0$, $y = -9$; symmetry is $x = 0$.
- Sketch $y = -2x + 4$ as a line through $(0, 4)$ and $(2, 0)$.

■ Method check

A quadratic sketch needs its shape, roots and symmetry. Core does not require turning-point coordinates; a sketch is not an accurate scale graph.

2 Practice

2.1 State whether $y = 3x - 1$ is linear or quadratic. [2]

2.2 Find the roots of $y = x^2 - 16$. [2]

2.3 State the opening direction and y -intercept of $y = -x^2 + 9$. [2]

2.4 A quadratic crosses the x -axis at -2 and 6 . Find its line of symmetry. [2]

3 Exam-style questions

3.1 Apply the sketching curves methods below. Show working and include units where appropriate.

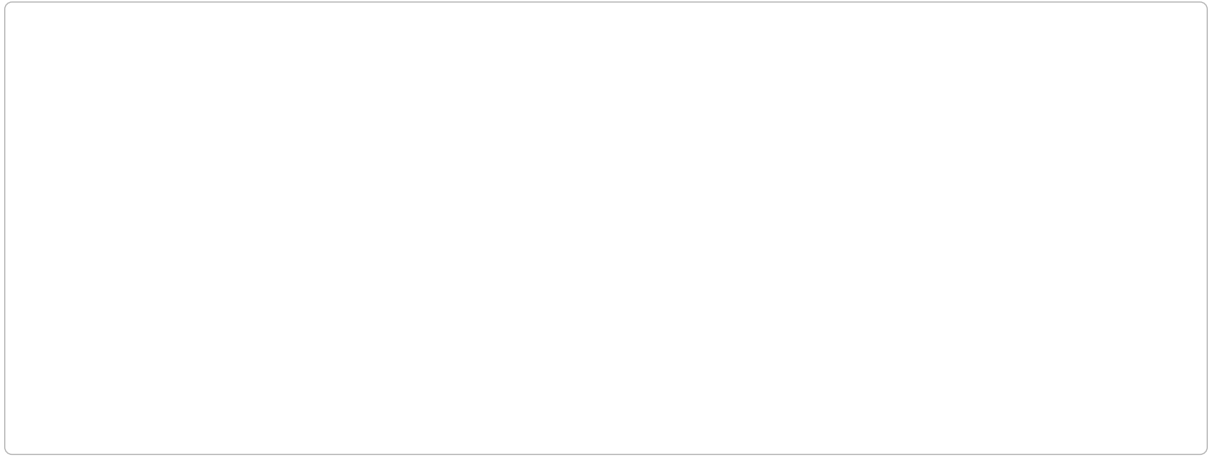
- (a) For $y = 4 - x^2$, find the two roots. [2]

- (b) Find the y -intercept and line of symmetry. [2]

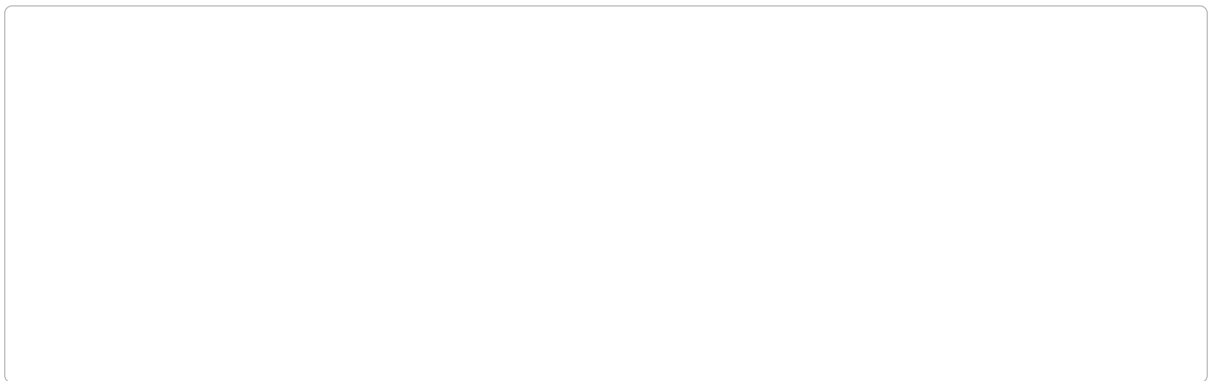
- (c) Sketch the curve with its crossings labelled. [2]

3.2 Consider $y = x^2 - 9$ and $y = 3x - 6$.

(a) Sketch the quadratic, labelling its roots, y-intercept and line of symmetry. [3]



(b) Find the intercepts of the straight line and sketch it. State which graph has two x-axis crossings and explain why. [3]



Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- The highest power is 1: **linear**.

2.2

- $x^2 = 16$ at a root: $x = -4, 4$.

2.3

- Negative square term means **downwards**; at $x = 0$, $(0, 9)$.

2.4

- Take the midpoint: $x = (-2 + 6)/2 = 2$, so $x = 2$.

3.1

(a)

- $x^2 = 4$, so $x = -2, 2$.

(b)

- At $x = 0$, $y = 4$, so $(0, 4)$. Symmetry is $x = 0$.

(c)

- **Downward smooth curve through** $(-2, 0)$, $(0, 4)$, $(2, 0)$, symmetric about the y -axis.

3.2

(a)

- The roots are **-3 and 3** .
- The y -intercept is **$(0, -9)$** and symmetry is **$x = 0$** .
- Draw a smooth upward-opening U-shape through the labelled crossings.

(b)

- The line has x -intercept **$(2, 0)$** and y -intercept **$(0, -6)$** .
- Draw the straight line through them.
- The quadratic has two crossings because $x^2 = 9$ has positive and negative roots; the nonhorizontal line has one.