

Exercise walk-through

C2.11

Sketching curves

IGCSE Mathematics

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

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The method

Method — 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.

Exercises 2.1·2.3

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]

Exercises 2.1·2.3

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

2.1

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

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

2.2

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

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

2.3

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

Exercise 2.4

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

3 Exam-style questions

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

3 Exam-style questions

2.4

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

Exercise 3.1 (a)

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]

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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]

(a)

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

Exercise 3.1 (b)

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

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

[2]

Exercise 3.1 (b)

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

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

[2]

(b)

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

Exercise 3.1 (c)

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

(c) Sketch the curve with its crossings labelled.

[2]

Exercise 3.1 (c)

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

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

(c)

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

Exercise 3.2 (a)

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]

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

(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.

Exercise 3.2 (b)

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

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

Exercise 3.2 (b)

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

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

(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.