

Exercise walk-through

Sketching curves ■ E2.11

eXercise

You must be able to

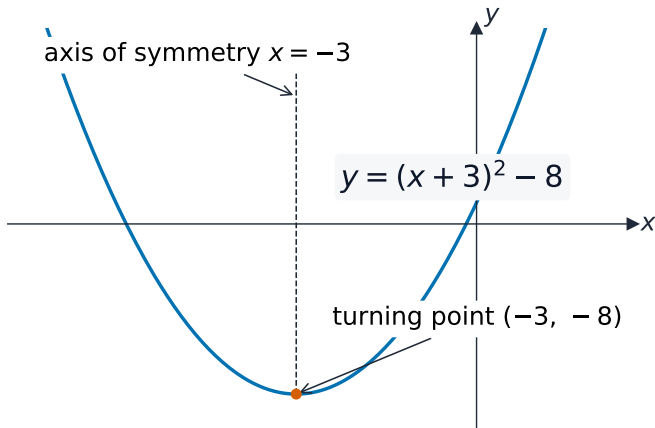
- recognise the shape of linear, quadratic, cubic and reciprocal graphs
- find the turning point of a parabola by completing the square
- state the line of symmetry of a parabola

Method — Shapes and turning points

- **Shapes:** linear (line), **quadratic** (a **parabola** 抛物线, U if $a > 0$), cubic (S-shape), reciprocal (two curves).
- **Turning point:** $y = (x + 3)^2 - 8$ has its turning point at $(-3, -8)$.
- **Line of symmetry** 对称轴: the vertical line through the turning point ($x = -3$ here).

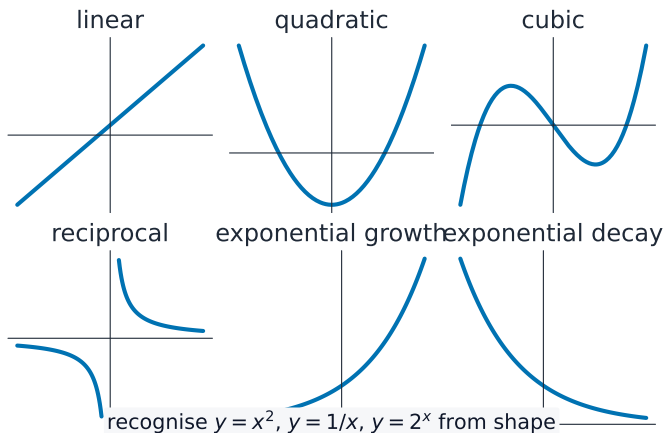
Answer shapes: **M1** a correct method, **A1** the correct answer.

Method — Shapes and turning points



A parabola with its turning point and line of symmetry

Method — Shapes and turning points



The family of standard curve shapes to recognise

Practice 2.1 ■ 1 mark

Write down the shape of the graph of $y = x^2 + 1$.

Solution 2.1

Worked steps

a parabola (a U-shaped curve) **B1**.

Practice 2.2 ■ 1 mark

Write down the turning point of $y = (x - 4)^2 + 2$.

Solution 2.2

Method: Shapes and turning points

Worked steps

$(4, 2)$ **B1**.

Practice 2.3 ■ 1 mark

Write down the y -intercept of $y = 3x - 5$.

Solution 2.3

Worked steps

the y -intercept is -5 **B1**.

Exam-style 3.1 ■ 2 marks

Write $x^2 + 6x + 5$ in the form $(x + p)^2 + q$.

Solution 3.1

Worked steps

half of 6 is 3, $3^2 = 9$: $x^2 + 6x + 5 = (x + 3)^2 - 9 + 5 = (x + 3)^2 - 4$ **M1** **A1** for $(x + 3)^2$; for $(x + 3)^2 - 4$.

Exam-style 3.2 ■ 1 mark

Hence write down the coordinates of the turning point of $y = x^2 + 6x + 5$.

Solution 3.2

Method: Shapes and turning points

Worked steps

the turning point is $(-3, -4)$ **B1** *follow-through from 3.1.*

Exam-style 3.3 ■ 1 mark

Write down the equation of the line of symmetry of $y = x^2 + 6x + 5$.

Solution 3.3

Method: Shapes and turning points

Worked steps

the line of symmetry is $x = -3$ **B1** *follow-through*.