IGCSE MATHEMATICS • EXERCISE SHEET

E2.11 Sketching curves

Name: _____ Class: _____ Date: _____ **Total: 7 marks**

KEY WORDS turning point 转折点 • parabola 抛物线 • shapes 形状 • line of symmetry 对称轴 • symmetry 对称

Objective

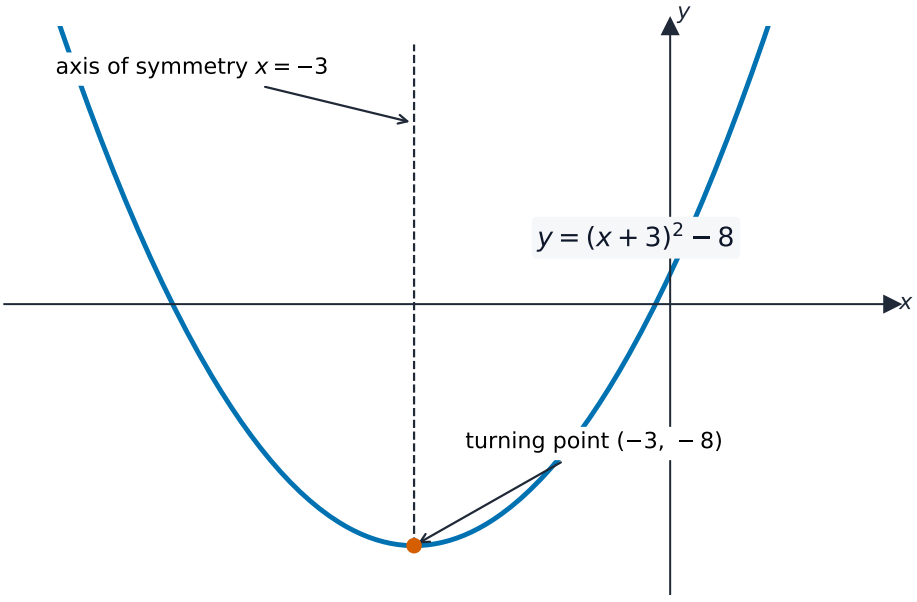
Build the skills to answer Extended exam questions on **sketching curves** 草绘曲线 — the **shapes** 形状 of common graphs, the **turning point** 转折点 of a parabola, and key features.

You must be able to:

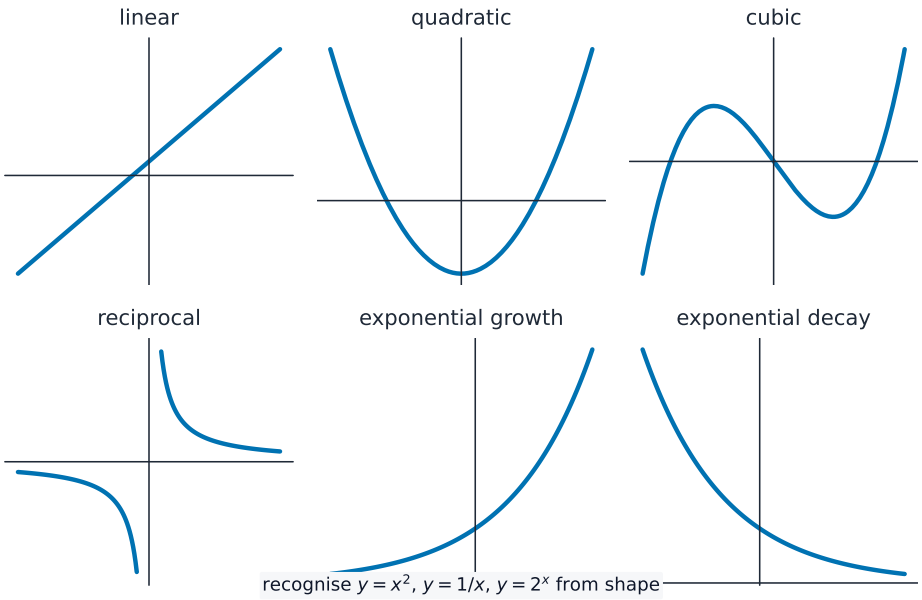
- recognise the shape of linear, quadratic, cubic and reciprocal graphs
- find the turning point of a parabola by completing the square
- state the line of symmetry of a parabola

1 Worked examples

■ Shapes and turning points



Completing the square gives the turning point



The family of standard curve shapes to recognise

- **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.

2 Practice

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

2.2 Write down the turning point of $y = (x - 4)^2 + 2$. [1]

2.3 Write down the y-intercept of $y = 3x - 5$. [1]

3 Exam-style questions

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

3.2 Hence write down the coordinates of the turning point of $y = x^2 + 6x + 5$. [1]

3.3 Write down the equation of the line of symmetry of $y = x^2 + 6x + 5$. [1]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 a parabola (a U-shaped curve).

2.2 $(4, 2)$.

2.3 the y-intercept is -5.

3.1 half of 6 is 3, $3^2 = 9$: $x^2 + 6x + 5 = (x + 3)^2 - 9 + 5 = (x + 3)^2 - 4$.

3.2 the turning point is $(-3, -4)$.

3.3 the line of symmetry is $x = -3$.