

 **Key Facts**

- Quadratic form:  $f(x) = ax^2 + bx + c$
- If  $a > 0$ : concave up  $\cup$
- If  $a < 0$ : concave down  $\cap$
- Axis of symmetry:  $x = -\frac{b}{2a}$
- Vertex: substitute axis into  $f(x)$
- y-intercept: let  $x = 0$ , so  $y = c$

**Section A – Guided Practice** (work with a partner)

**Question 1.** For the quadratic  $f(x) = x^2 - 6x + 5$ :

3 marks

(a) Find the y-intercept

\_\_\_\_\_

(c) Find the axis of symmetry

\_\_\_\_\_

(b) Find the x-intercepts

\_\_\_\_\_

(d) Find the vertex

\_\_\_\_\_

(e) Sketch the graph below, labelling all key features

graph space

**Question 2.** For the quadratic  $f(x) = -x^2 + 4x + 12$ :

3 marks

(a) State whether the parabola is concave up or down. Explain why.

(b) Find the y-intercept and x-intercepts

\_\_\_\_\_

(c) Find the axis of symmetry and vertex

(d) Sketch the graph below

graph space

**Question 3.** Match each equation to the correct description.

2 marks

**Equations:**

- A:  $f(x) = x^2 - 4$
- B:  $f(x) = -2x^2 + 1$
- C:  $f(x) = (x - 3)^2$
- D:  $f(x) = x^2 + 2x - 3$

**Descriptions:**

- 1: Vertex at the origin shifted right 3 units
- 2: Concave down, y-intercept at 1
- 3: y-intercept at -4, concave up
- 4: x-intercepts at -3 and 1

Answers: A — \_\_\_\_ B — \_\_\_\_ C — \_\_\_\_ D — \_\_\_\_

## Section B – Independent Practice

**Question 4.** Sketch the graph of  $f(x) = 2x^2 - 4x - 6$ . Label all key features.

3 marks

Show all working:

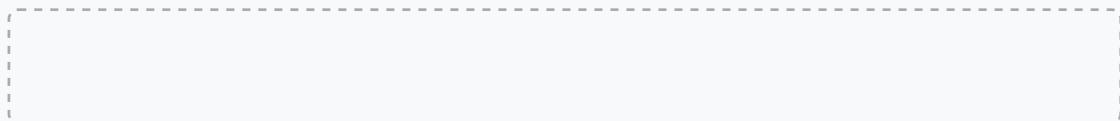


graph space

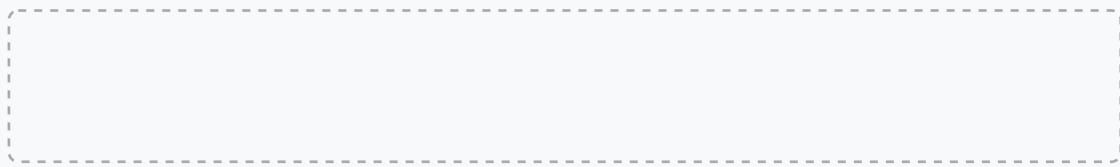
**Question 5.** A quadratic function has x-intercepts at  $x = -1$  and  $x = 5$ , and a y-intercept at  $y = -5$ .

3 marks

(a) Find the axis of symmetry.



(b) Find the vertex.



(c) Sketch the parabola.

graph space

**Question 6.** The height  $h$  metres of a ball thrown upward is given by  $h(t) = -5t^2 + 20t + 2$ , where  $t$  is time in seconds. 3 marks

(a) What is the initial height of the ball?

(b) At what time does the ball reach its maximum height?

(c) What is the maximum height?

### ★ Extension

**Question 7.** The parabola  $f(x) = ax^2 + bx + c$  passes through the points  $(0, 3)$ ,  $(1, 0)$ , and  $(3, 0)$ . Find the values of  $a$ ,  $b$ , and  $c$ . 1 mark

**Question 8.** Describe the transformations that map  $f(x) = x^2$  onto  $g(x) = -2(x + 1)^2 + 4$ . Sketch both functions on the same axes. 2 marks

