

Features of a Parabola

Key Information

A parabola is the curved graph of a quadratic function.

- The vertex is the turning point of the parabola.
- The axis of symmetry is the vertical line passing through the vertex.
- An upward-opening parabola has a minimum point.
- A downward-opening parabola has a maximum point.
- In $y = a(x - h)^2 + k$, the vertex is (h, k) and the axis of symmetry is $x = h$.

Identifying Features

For each function, identify the vertex, axis of symmetry, opening direction, and maximum or minimum point.

1. $y = (x - 2)^2 + 1$

Vertex: _____ Axis of symmetry: _____ Opens: up / down Vertex is a: max / min

2. $y = -(x + 3)^2 + 5$

Vertex: _____ Axis of symmetry: _____ Opens: up / down Vertex is a: max / min

3. $y = 2(x - 1)^2 - 4$

Vertex: _____ Axis of symmetry: _____ Opens: up / down Vertex is a: max / min

4. $y = -3(x - 4)^2 - 2$

Vertex: _____ Axis of symmetry: _____ Opens: up / down Vertex is a: max / min

Reading a Table

The table shows values for the quadratic function $y = x^2 - 4$

x	-3	-2	-1	0	1	2	3
y							

5. What is the lowest point shown in the table?
6. What is the vertex of the parabola?
7. What is its axis of symmetry?
8. Does the parabola open upward or downward?
9. Does the parabola have a maximum or minimum point? State its value.

Features of a Parabola

Describing a Parabola

10. Complete the sentences using the words below.

vertex upward minimum curved symmetrical

The graph has a _____ shape.

Its turning point is called the _____.

The graph is _____ on either side of its axis of symmetry.

It opens _____, so its vertex is a _____ point.

11. Describe the difference between a maximum point and a minimum point.

12. A parabola has a vertex at $(-2, 6)$ and opens downward.

- a. Write its axis of symmetry.
- b. Does it have a maximum or minimum point?
- c. State the maximum or minimum value.

Challenge

13. A parabola has an axis of symmetry $x = 3$ and a minimum value of -5 .

- a. Write the coordinates of its vertex.
- b. Does the parabola open upward or downward?
- c. Describe its overall shape.

Features of a Parabola

Identifying Features

For each function, identify the vertex, axis of symmetry, opening direction, and maximum or minimum point.

2. $y = (x - 2)^2 + 1$

Vertex: (2, 1)

Axis of symmetry: $x = 2$

Opens: up / down

Vertex is a: max / min

3. $y = -(x + 3)^2 + 5$

Vertex: (-3, 5)

Axis of symmetry: $x = -3$

Opens: up / down

Vertex is a: max / min

4. $y = 2(x - 1)^2 - 4$

Vertex: (1, -4)

Axis of symmetry: $x = 1$

Opens: up / down

Vertex is a: max / min

6. $y = -3(x - 4)^2 - 2$

Vertex: (4, -2)

Axis of symmetry: $x = 4$

Opens: up / down

Vertex is a: max / min

Reading a Table

The table shows values for the quadratic function $y = x^2 - 4$

x	-3	-2	-1	0	1	2	3
y	5	0	-3	-4	-3	0	5

7. What is the lowest point shown in the table?

$y = -4$

7. What is the vertex of the parabola?

(0, -4)

8. What is its axis of symmetry?

$x = 0$

9. Does the parabola open upward or downward?

upward

10. Does the parabola have a maximum or minimum point? State its value. Minimum at $y = -4$

Features of a Parabola

Describing a Parabola

11. Complete the sentences using the words below.

vertex **upward** **minimum** **curved** **symmetrical**

The graph has a **curved** shape.

Its turning point is called the **vertex**.

The graph is **symmetrical** on either side of its axis of symmetry.

It opens **upward**, so its vertex is a **minimum** point.

12. Describe the difference between a maximum point and a minimum point.

Maximum: parabola opens downward Minimum: parabola opens upward

13. A parabola has a vertex at $(-2, 6)$ and opens downward.

- a. Write its axis of symmetry. $x = -2$
- b. Does it have a maximum or minimum point? maximum
- c. State the maximum or minimum value. $y = 6$

Challenge

14. A parabola has an axis of symmetry $x = 3$ and a minimum value of -5 .

- a. Write the coordinates of its vertex. $(3, -5)$
- b. Does the parabola open upward or downward? upward
- c. Describe its overall shape. parabola