

# Parabolas

## Standard Form

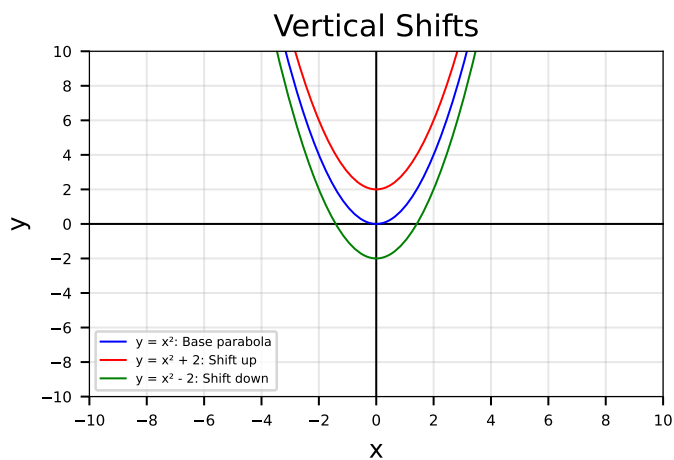
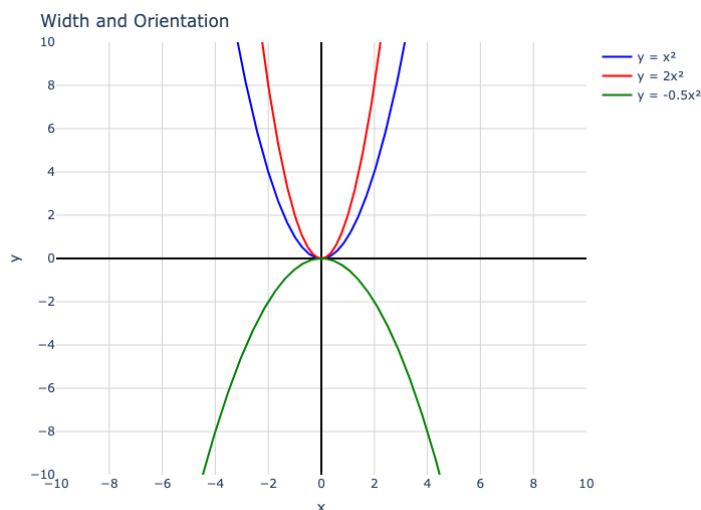
$$f(x) = ax^2 + bx + c$$

The coefficient  $a$  determines both width and direction:

- $a > 0$ : Opens upward
- $a < 0$ : Opens downward
- $|a| > 1$ : Narrower
- $|a| < 1$ : Wider

The constant term  $c$  controls vertical position:

- $c > 0$ : shift up
- $c < 0$ : shift down



## Vertex Form

$$f(x) = a(x - h)^2 + k$$

- $h$  controls **horizontal shift**
  - $h > 0$ : shift right
  - $h < 0$ : shift left
- $k$  is the **vertical position** of the vertex
  - $k > 0$ : shift up
  - $k < 0$ : shift down

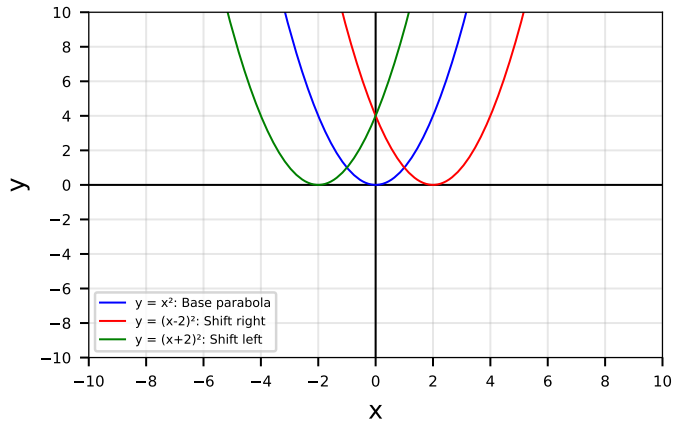
**Try it out!**

**Explore more**

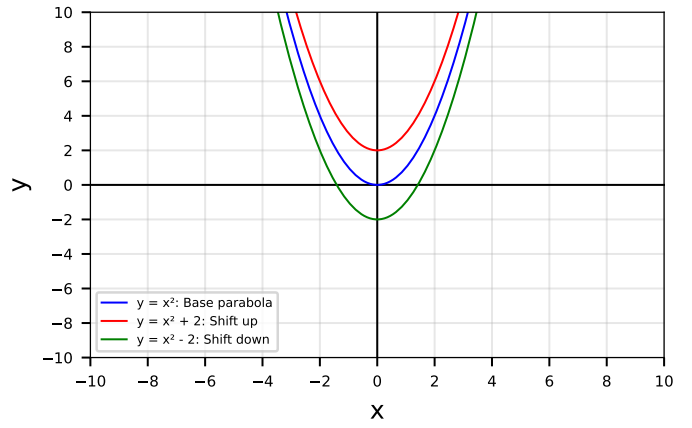
Parabolas appear in many real-world applications. Check out how they are used in:

- **Bridges and Architecture**: Learn how parabolic shapes provide structural efficiency in suspension bridges and architectural designs.
- **Projectile Motion**: Discover how parabolas describe the path of objects moving under gravity.

Vertex Horizontal Shifts



Vertex Vertical Shifts



- **Antennas and Satellite Dishes:** Explore how parabolic reflectors focus signals in communication systems.