

# General Equation of a Parabola



# Preliminaries and Objectives

## Preliminaries

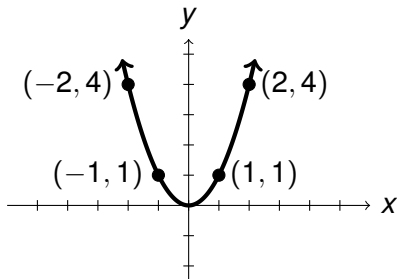
- Graph of  $y = x^2$
- Transformation of Graphs
  - Shifting graphs
  - Stretching graphs
  - Flipping graphs

## Objectives

- Find the equation of a parabola, given the graph.

# Standard Parabola

$$y = x^2$$

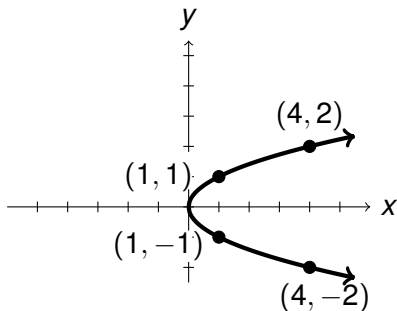


Axis of symmetry = y-axis

Vertex at  $(0, 0)$

# Standard Parabola - Horizontal Orientation

$$x = y^2$$

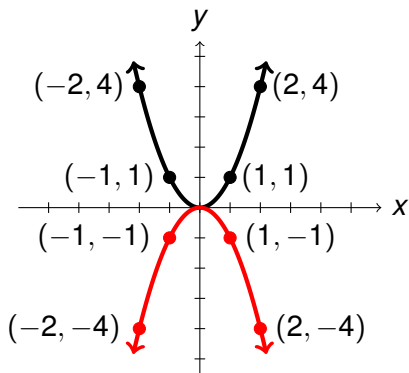


Axis of symmetry = x-axis

Vertex at (0, 0)

# Standard Parabola and Reflection

$$y = x^2$$

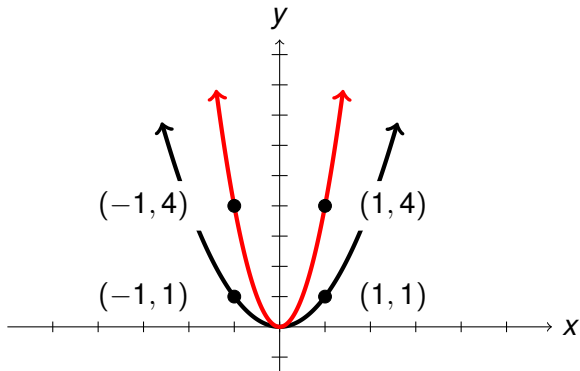


$$y = -x^2$$

# Stretching Parabolas

$$y = x^2$$

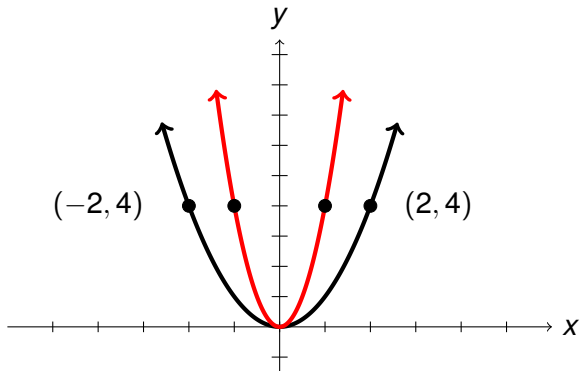
$$y = 4(x^2)$$



# Stretching Parabolas

$$y = x^2$$

$$y = (2x)^2$$



# General Form of a Parabola

$$y - k = \pm A(x - h)^2$$

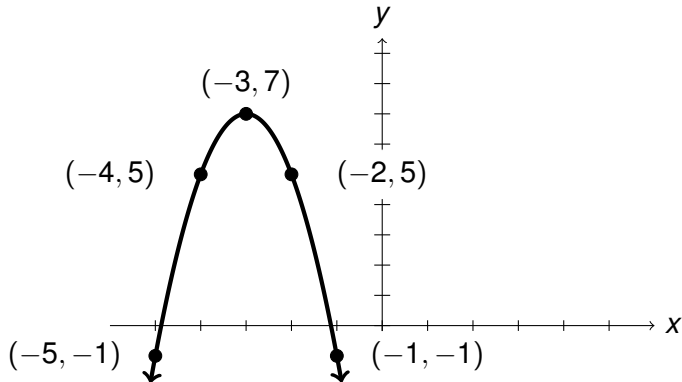
Vertex at  $(h, k)$ , stretched vertically by a factor of  $A$ , and reflected across the  $x$ -axis if negative.



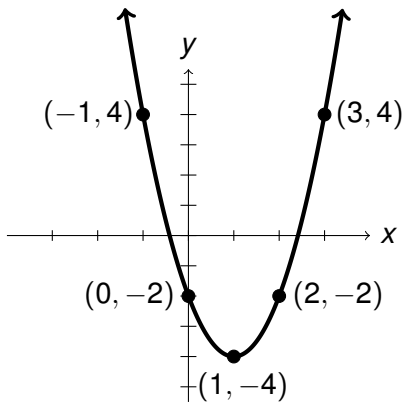
## Example 1

$$y = -2(x + 3)^2 + 7$$

$$y - 7 = -2(x + 3)^2$$



## Example 2



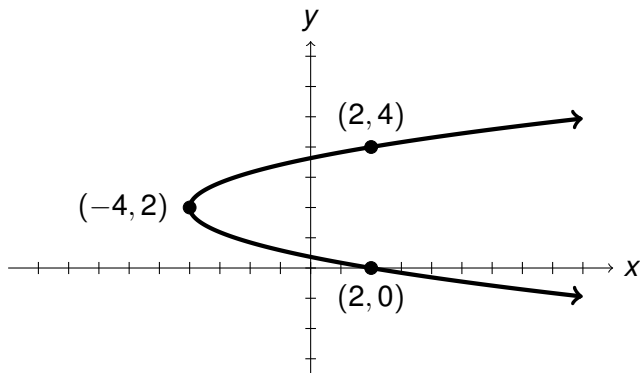
$$y + 4 = 2(x - 1)^2$$

# General Form of a Parabola - Horizontal Orientation

$$x - h = \pm A(y - k)^2$$

Vertex at  $(h, k)$ , stretched horizontally by a factor of  $A$ , and reflected across the  $y$ -axis if negative.

## Example 3



$$x + 4 = \frac{3}{2}(y - 2)^2$$

# Recap

- Standard Equation of a Parabola

$$y - k = \pm A(x - h)^2 \text{ and } x - h = \pm A(y - k)^2$$

- Form of the parabola

$$y = x^2 \quad \text{opens upward}$$

$$y = -x^2 \quad \text{opens downward}$$

$$x = y^2 \quad \text{opens to the right}$$

$$x = -y^2 \quad \text{opens to the left}$$

- Vertex at  $(h, k)$
- Stretched by a factor of  $A$  vertically for  $y = x^2$  and horizontally for  $x = y^2$