

## General Equation of a Parabola



## Preliminaries and Objectives

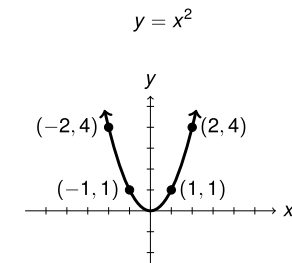
### Preliminaries

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

### Objectives

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

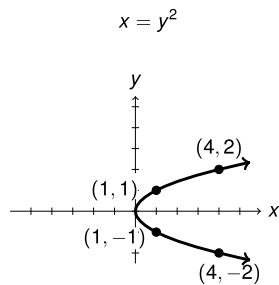
## Standard Parabola



Axis of symmetry =  $y$ -axis

Vertex at  $(0, 0)$

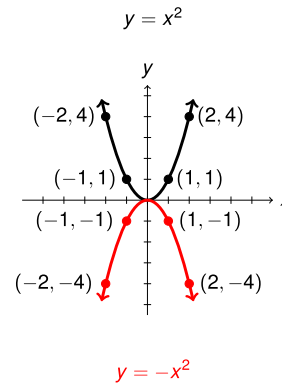
## Standard Parabola - Horizontal Orientation



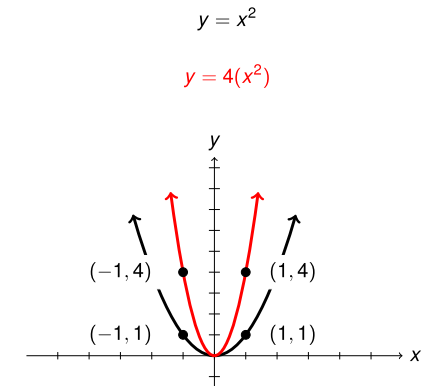
Axis of symmetry =  $x$ -axis

Vertex at  $(0, 0)$

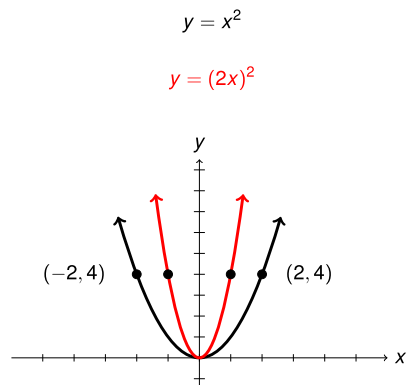
## Standard Parabola and Reflection



## Stretching Parabolas



## Stretching Parabolas



## General Form of a Parabola

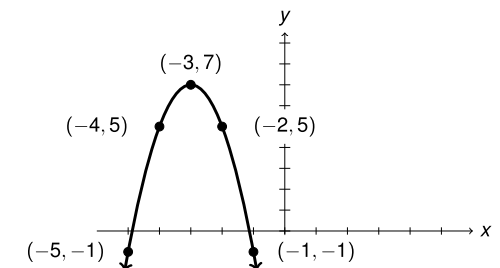
$$y - k = \pm A(x - h)^2$$

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

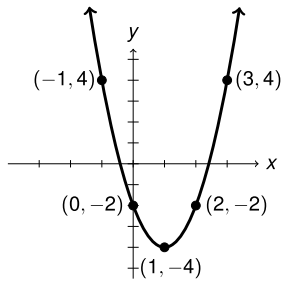
## Example 1

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

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



## Example 2



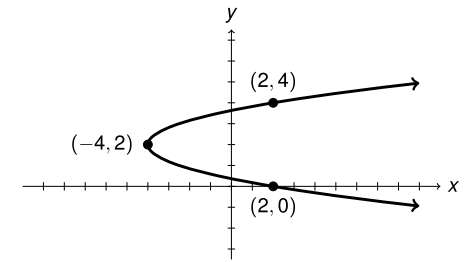
$$y + 4 = 2(x - 1)^2$$

## 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

$$\begin{aligned} y &= x^2 && \text{opens upward} \\ y &= -x^2 && \text{opens downward} \\ x &= y^2 && \text{opens to the right} \\ x &= -y^2 && \text{opens to the left} \end{aligned}$$

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