General Equation of a Parabola

Preliminaries and Objectives

Preliminaries

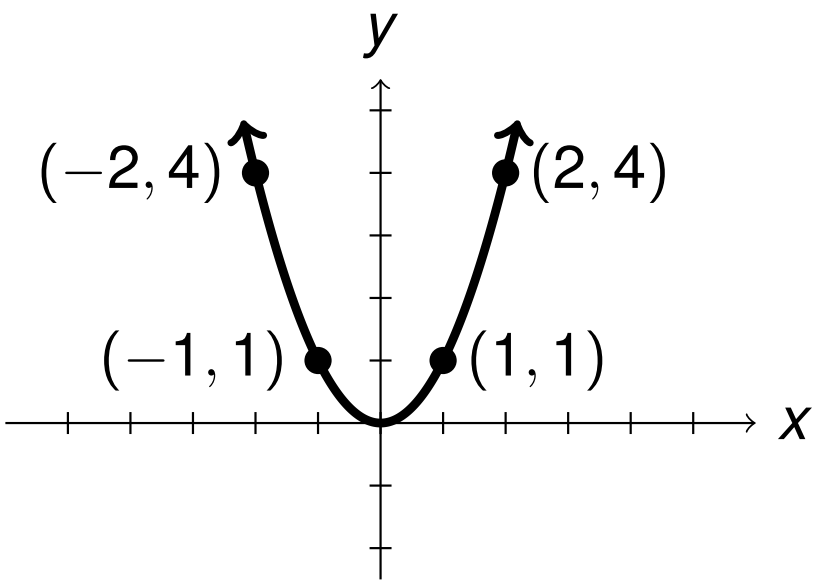
- Graph of $y = x^2$
- Transformation of Graphs
  - Shifting graphs
  - Stretching graphs
  - Flipping graphs

Objectives

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

Standard Parabola

$$y = x^2$$

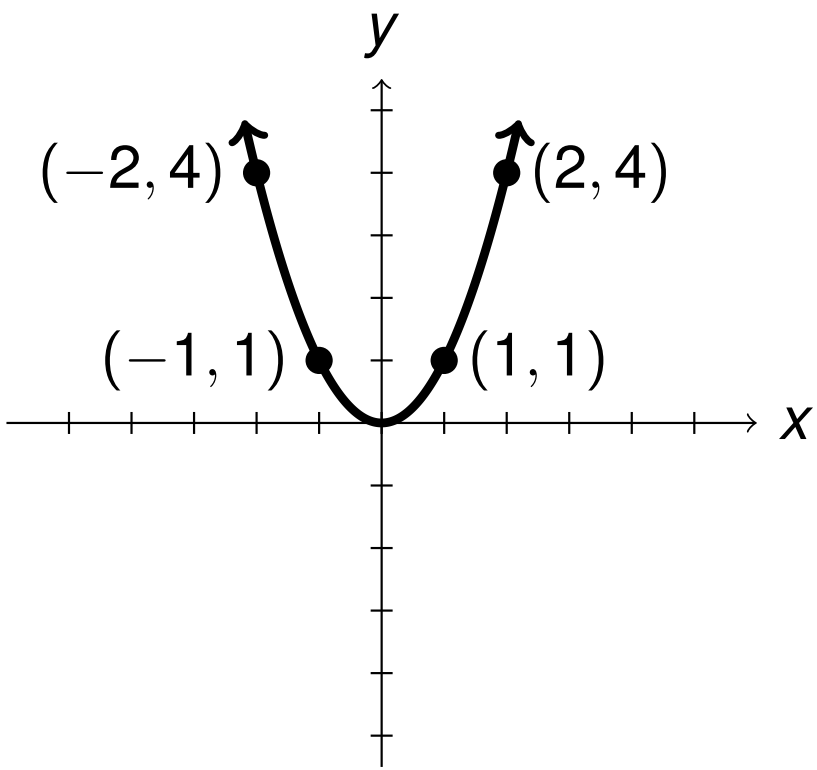


Axis of symmetry = y-axis

Vertex at $(0, 0)$

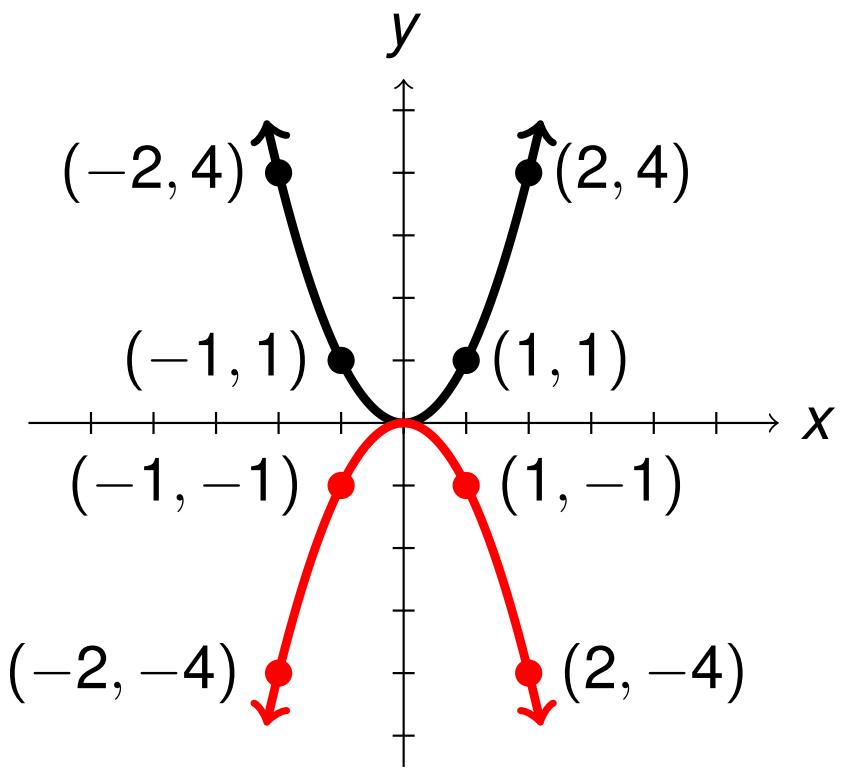
Standard Parabola

$$y = x^2$$



Standard Parabola and Reflection

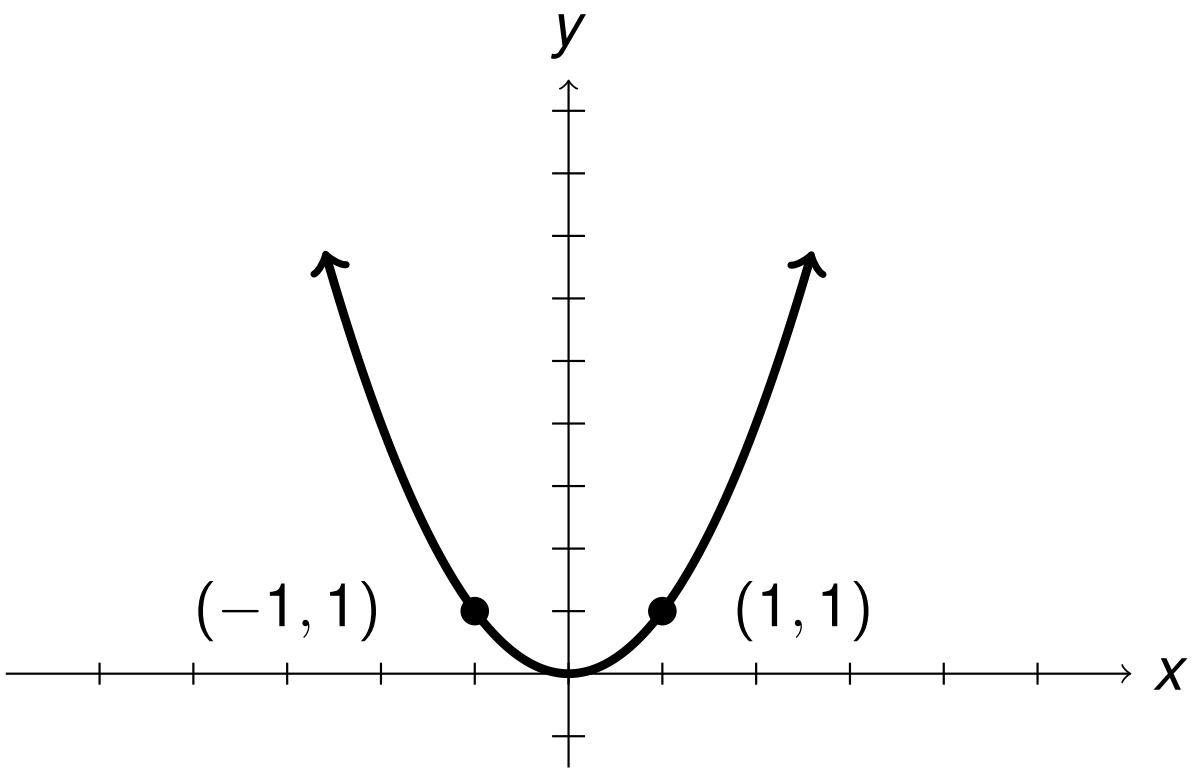
$$y = x^2$$



$$y = -x^2$$

Stretching Parabolas

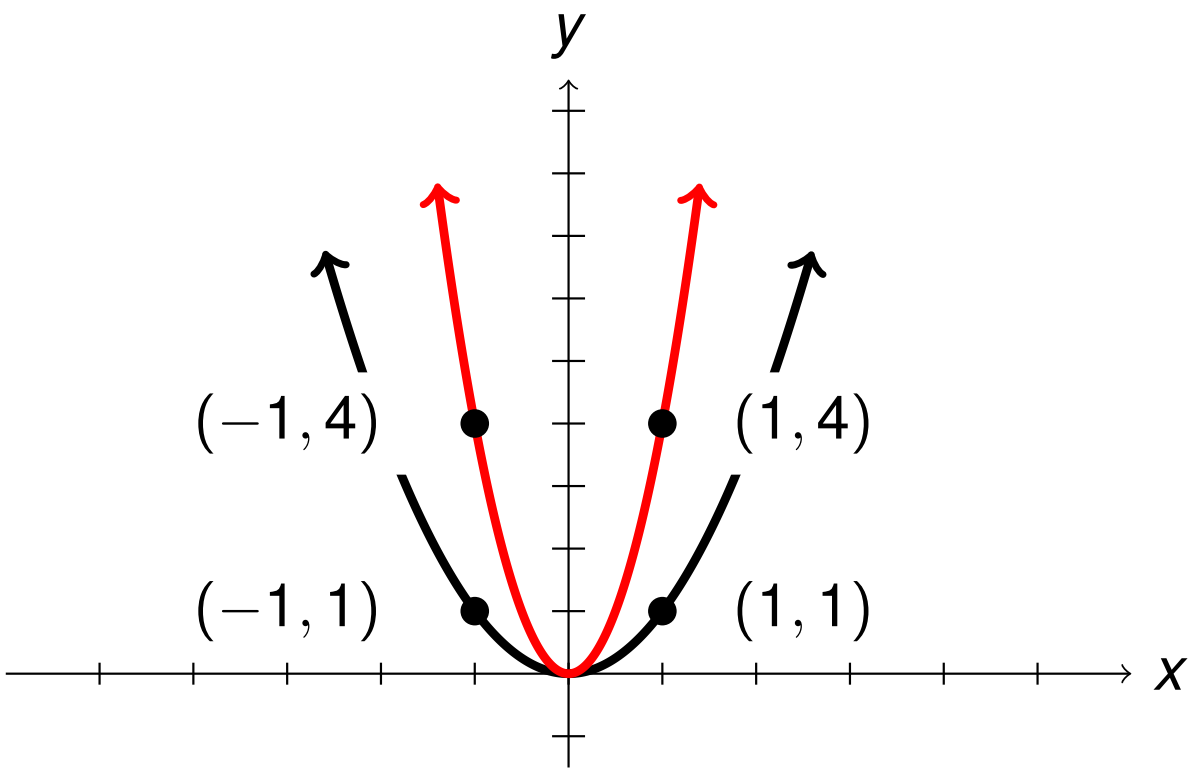
$$y = x^2$$



Stretching Parabolas

$$y = x^2$$

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



Stretching Parabolas

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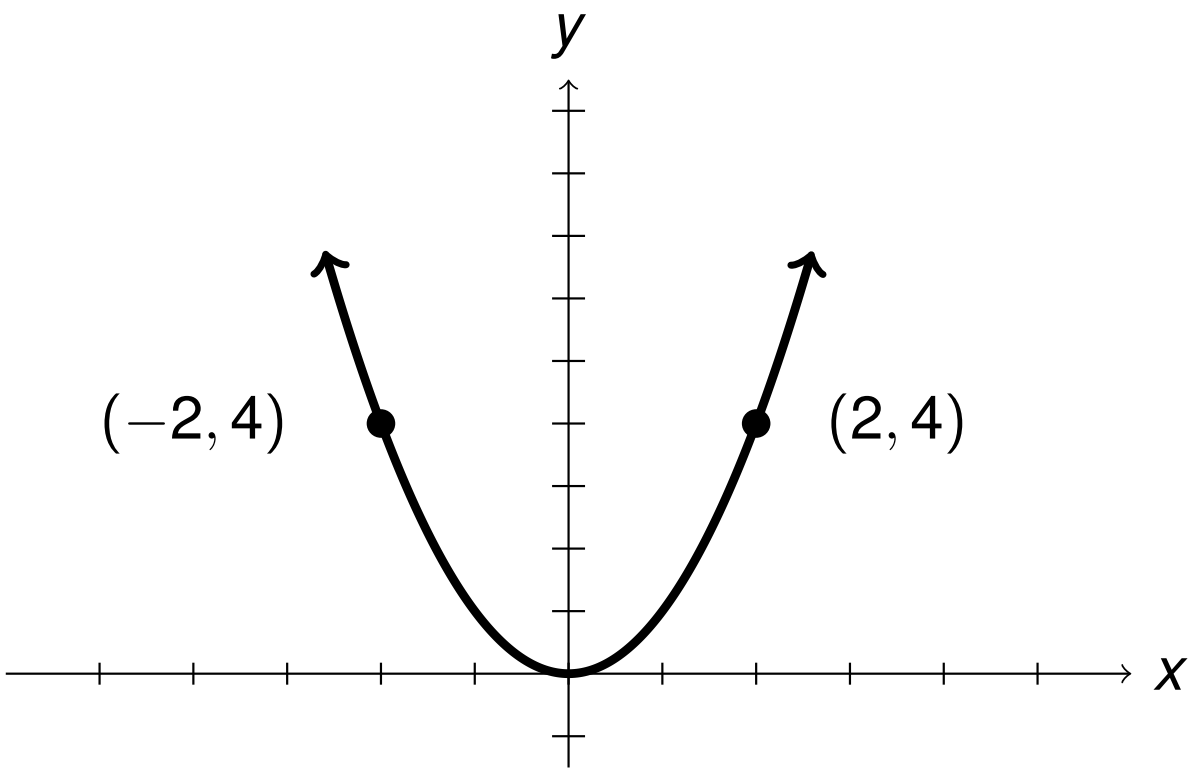
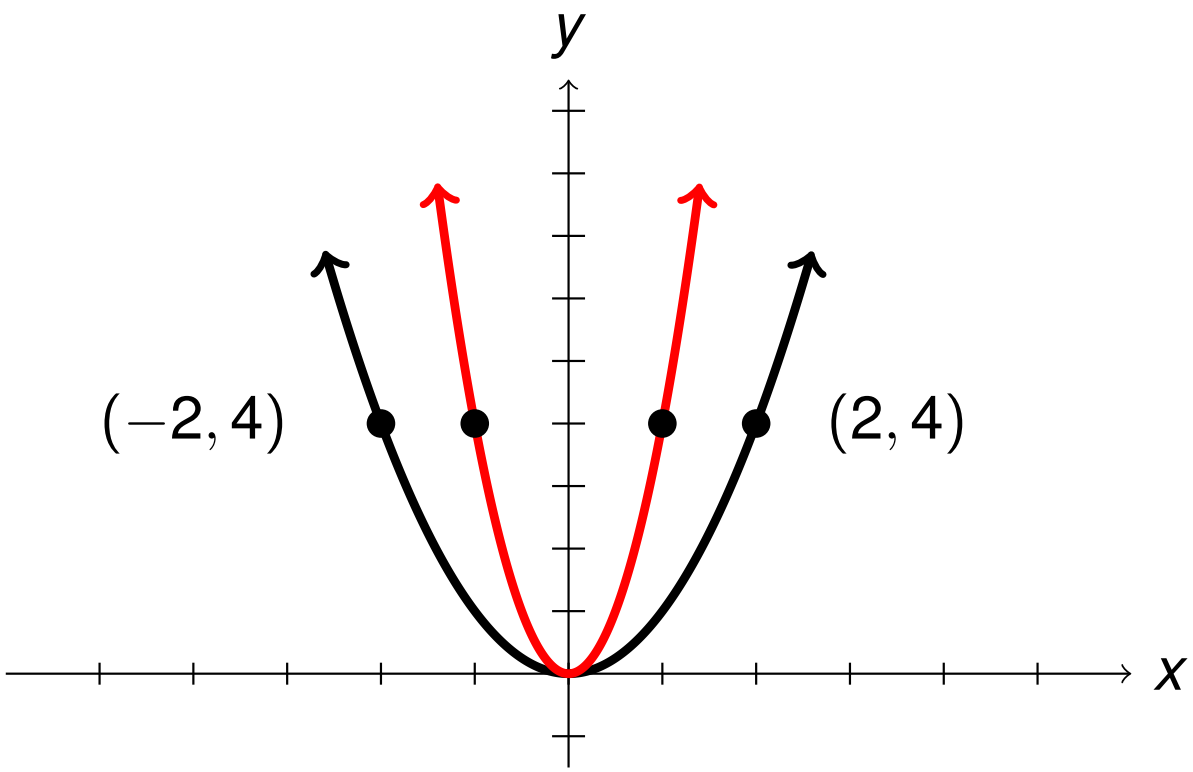


Stretching Parabolas

$$y = x^2$$

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



General Form of a Parabola

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

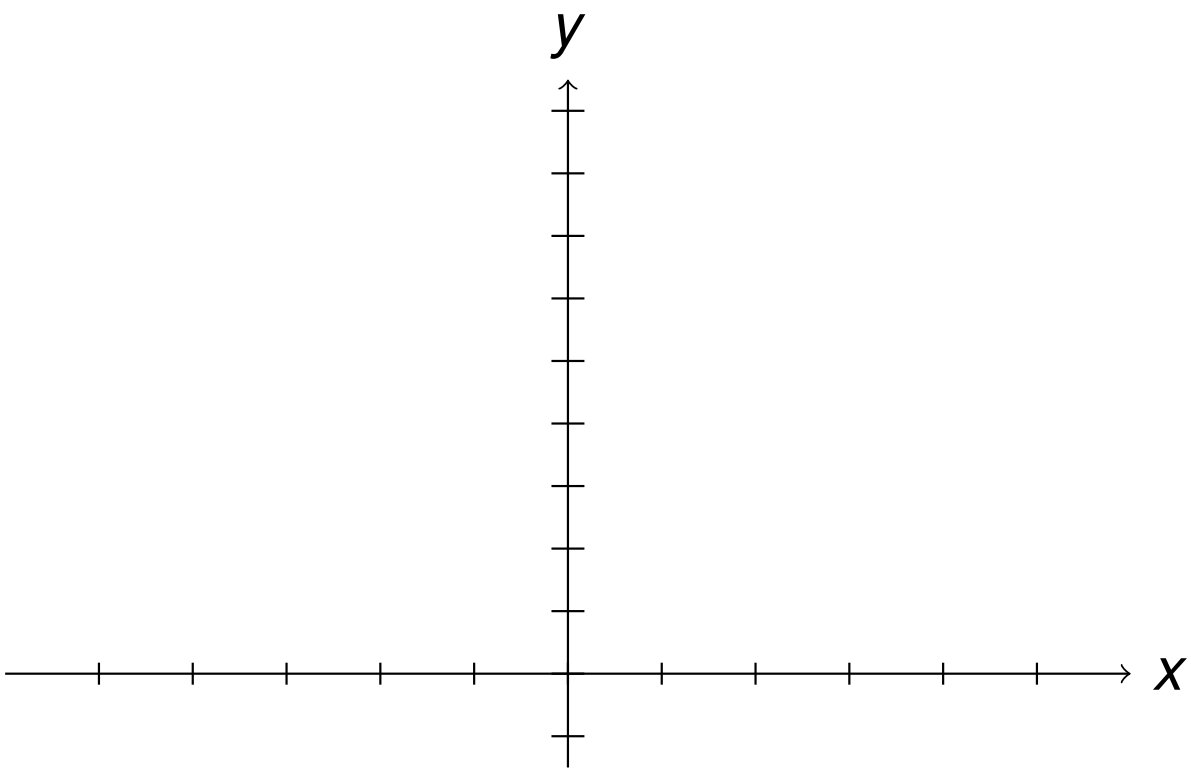
General Form of a Parabola

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

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

Example 1

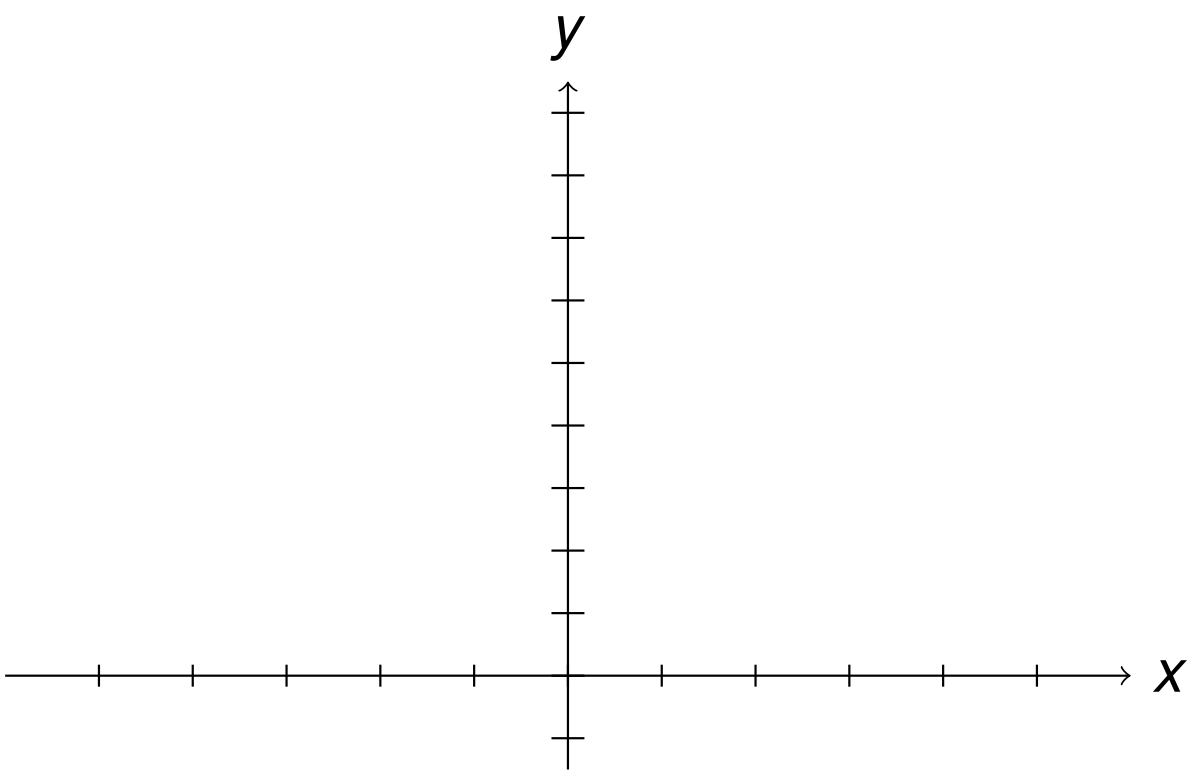
$$y = -3(x+2)^2 + 8$$



Example 1

$$y = -3(x+2)^2 + 8$$

$$y - 8 = -3(x+2)^2$$



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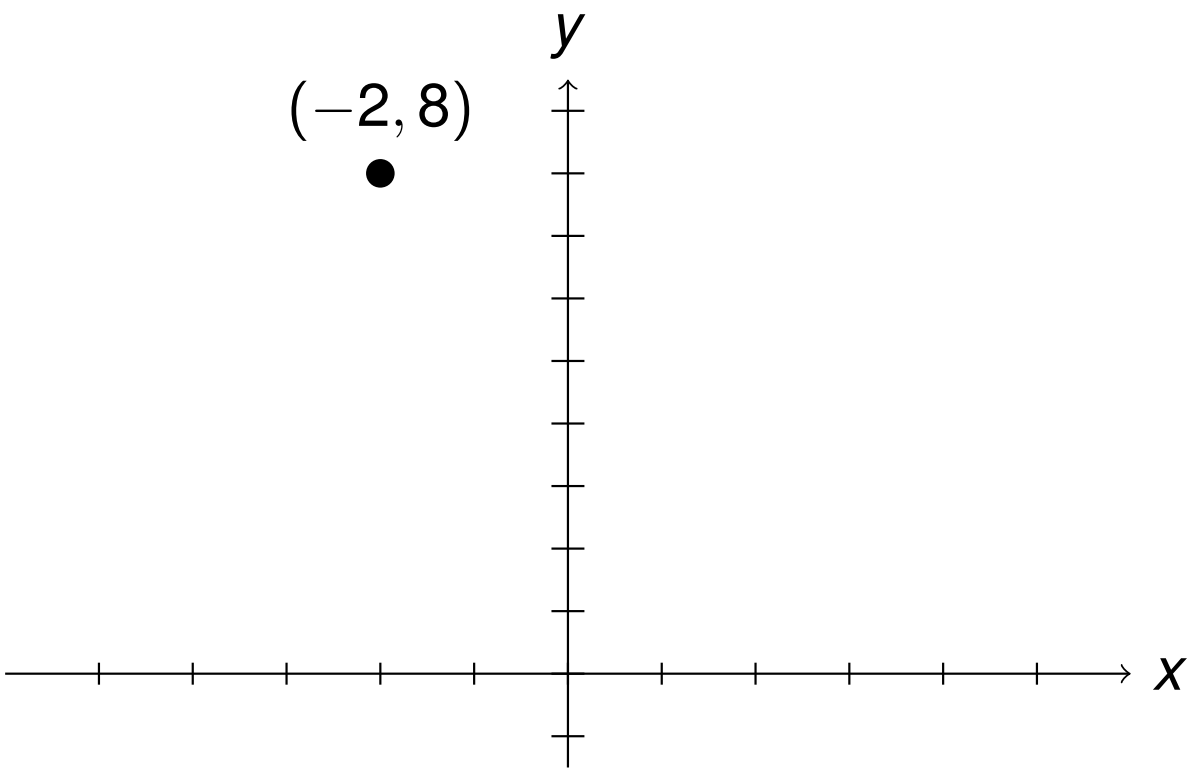

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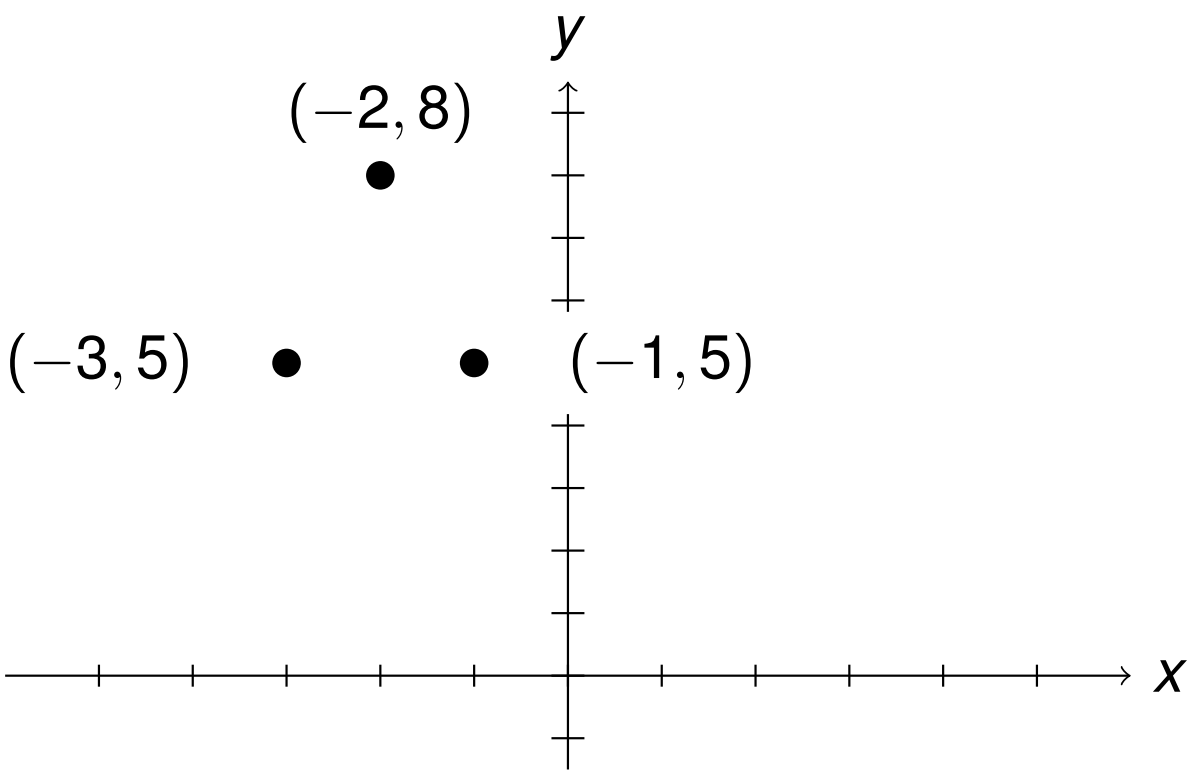

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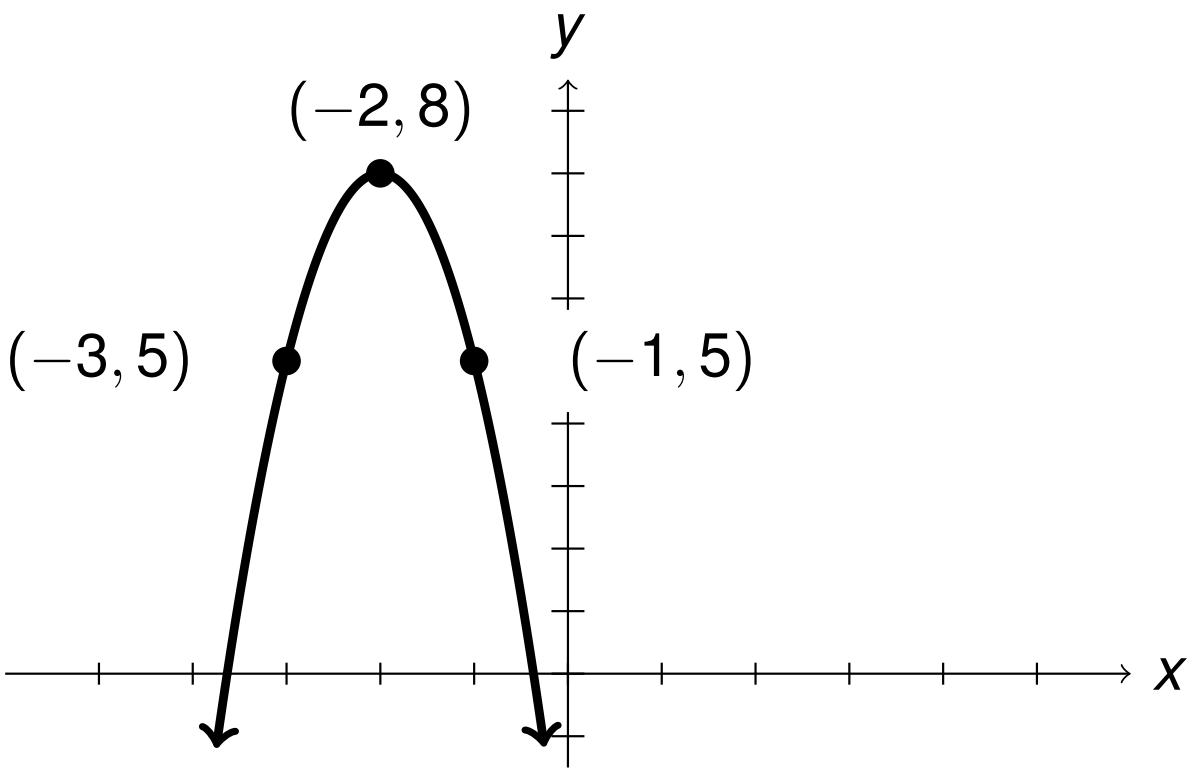
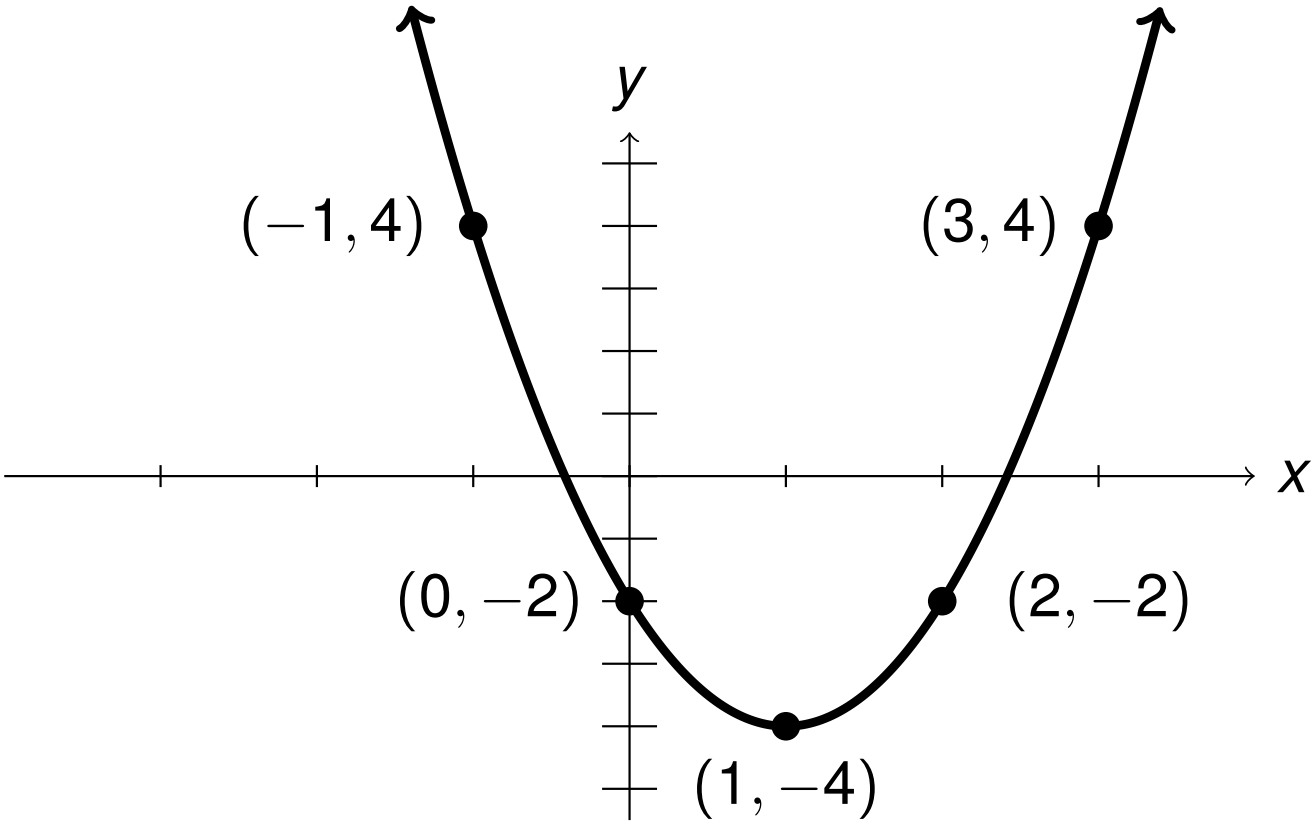


Example 2



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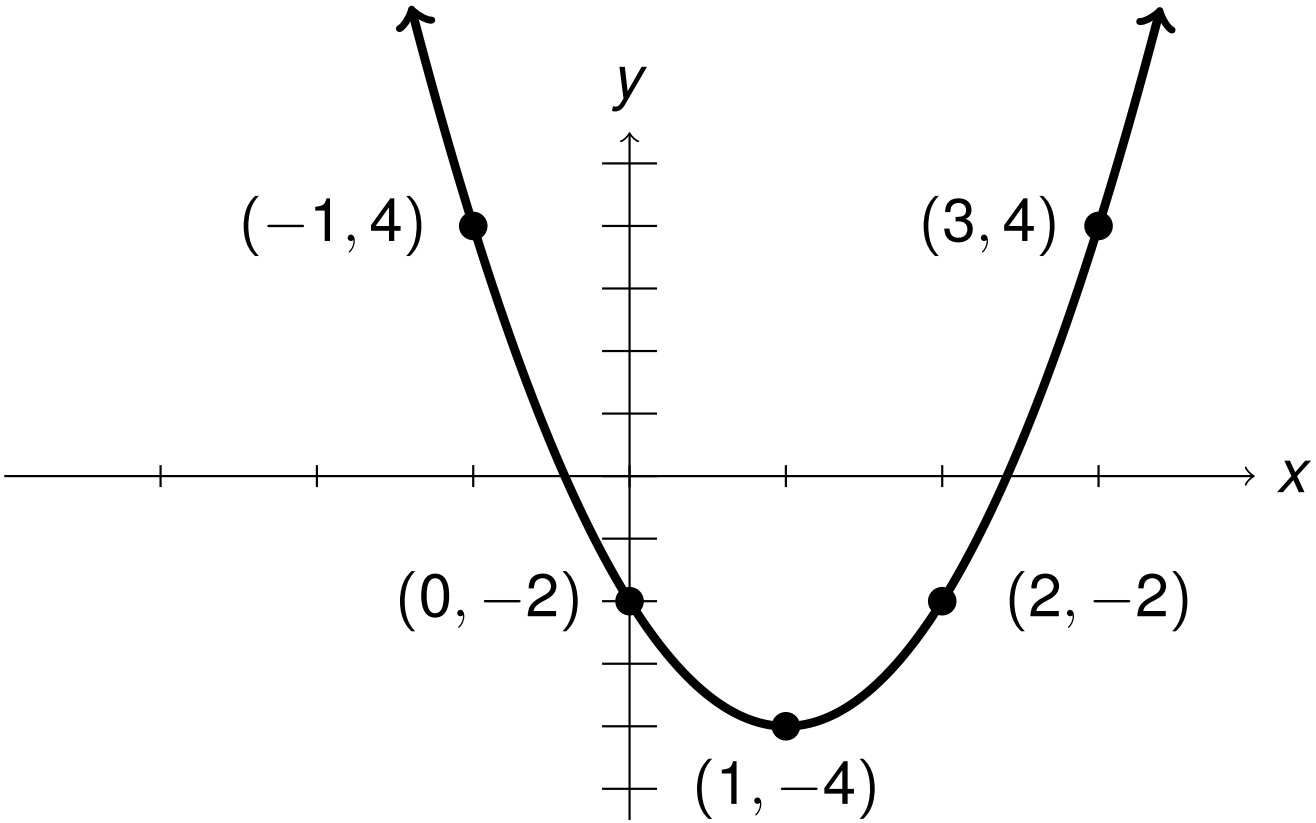
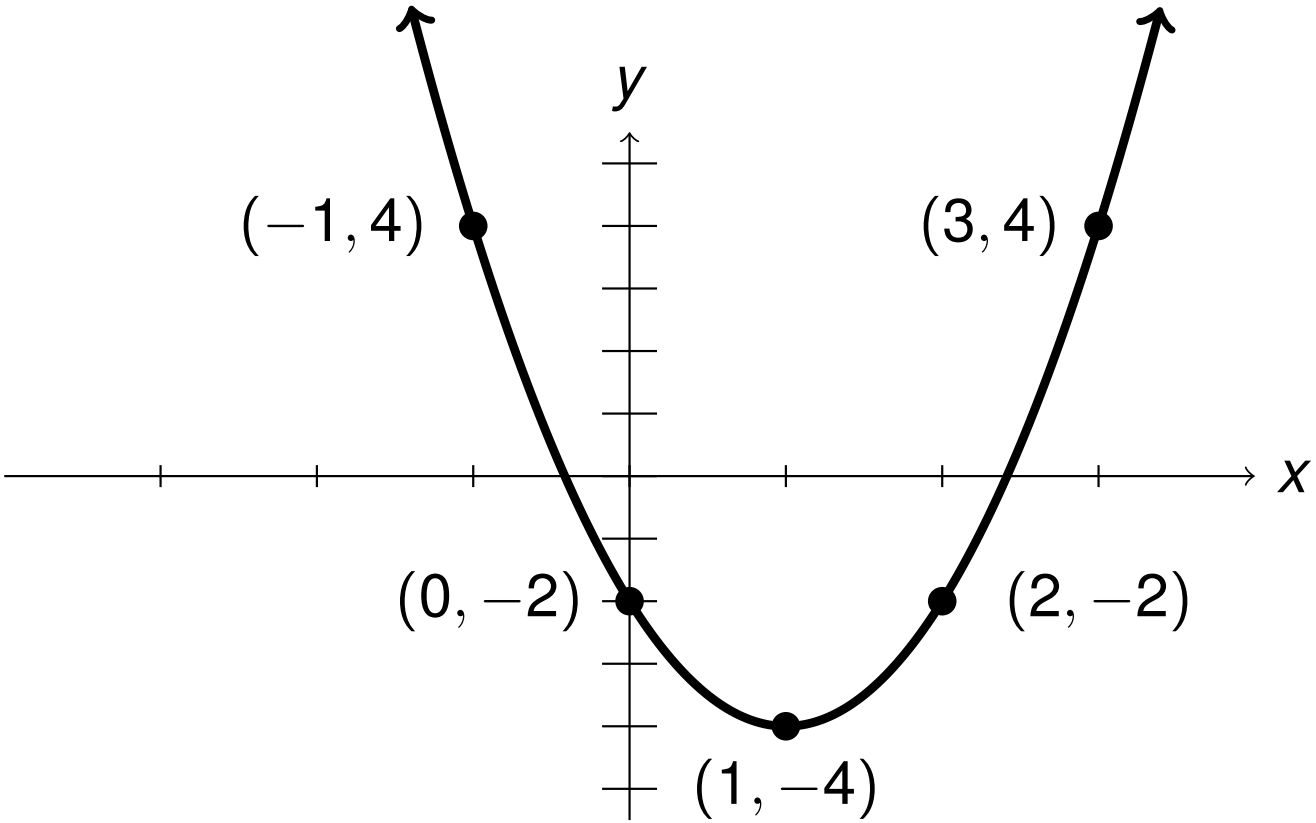


$$y + 4 = A(x - 1)^2$$

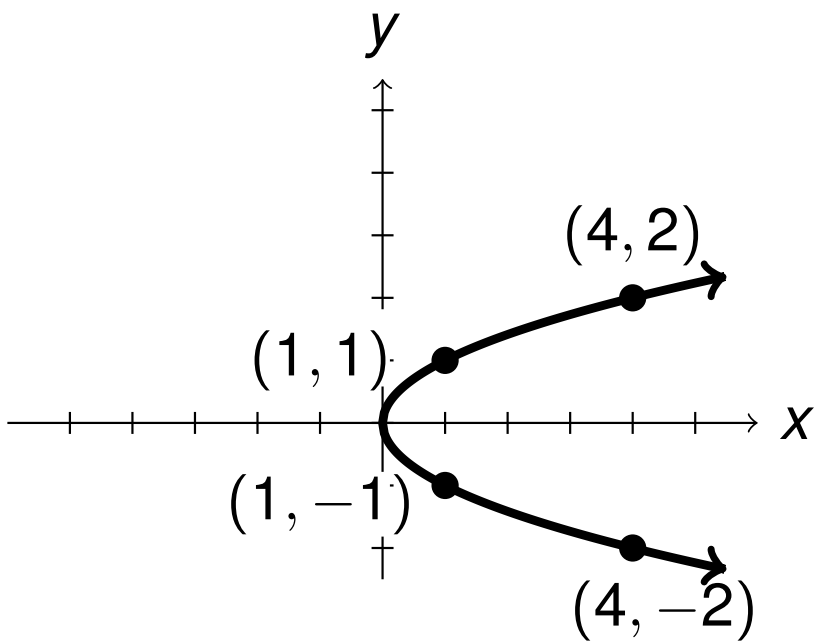
Example 2



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

Standard Parabola - Horizontal Orientation

$$x = y^2$$



Axis of symmetry = x-axis

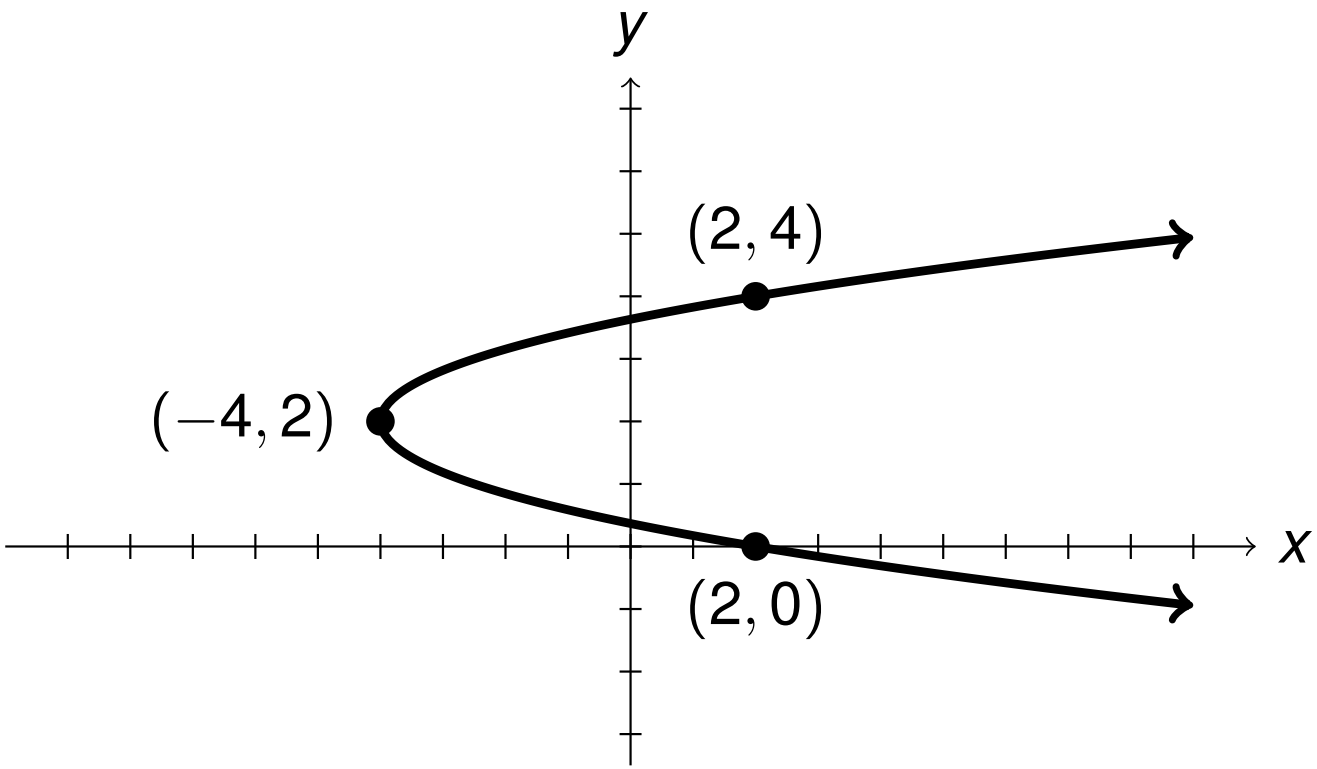
Vertex at $(0, 0)$

General Form of a Parabola - Horizonal Orientation

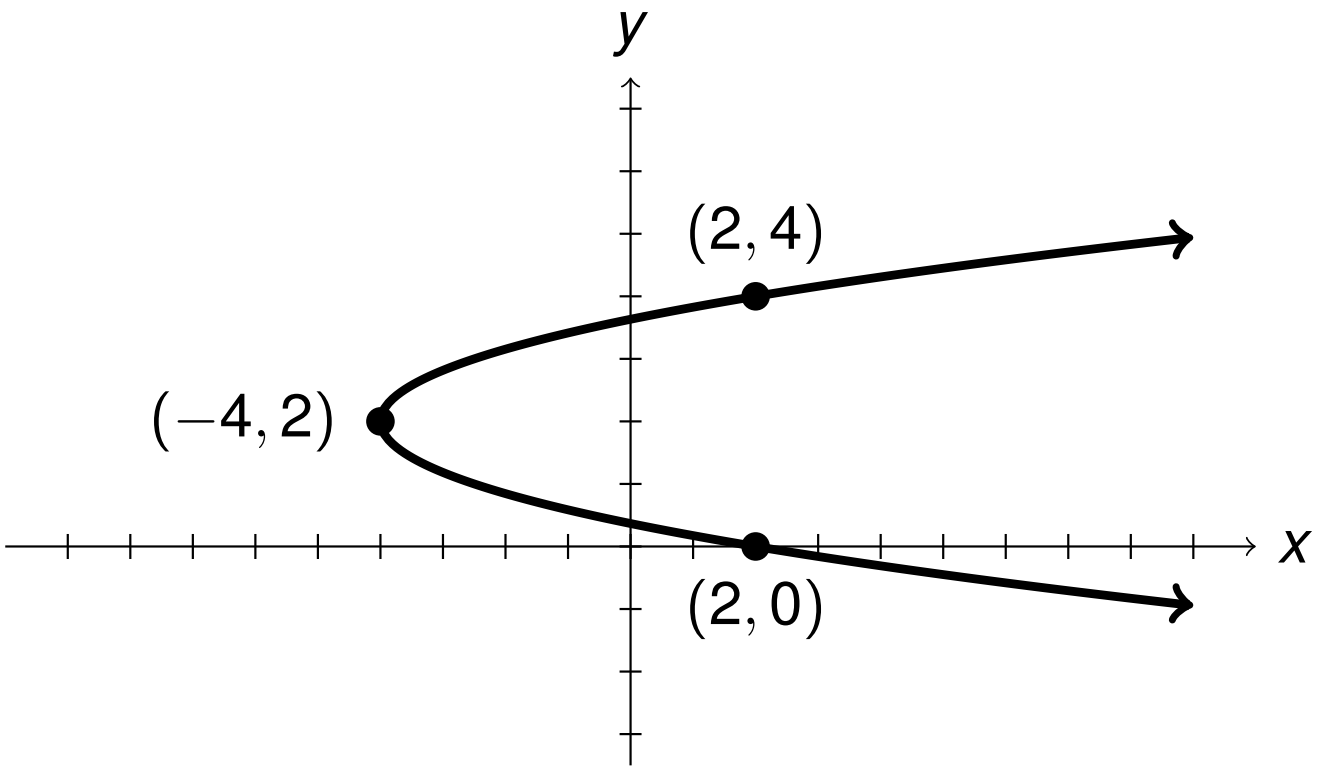
$$x - h = \pm A(y - k)^2$$

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

Example 3

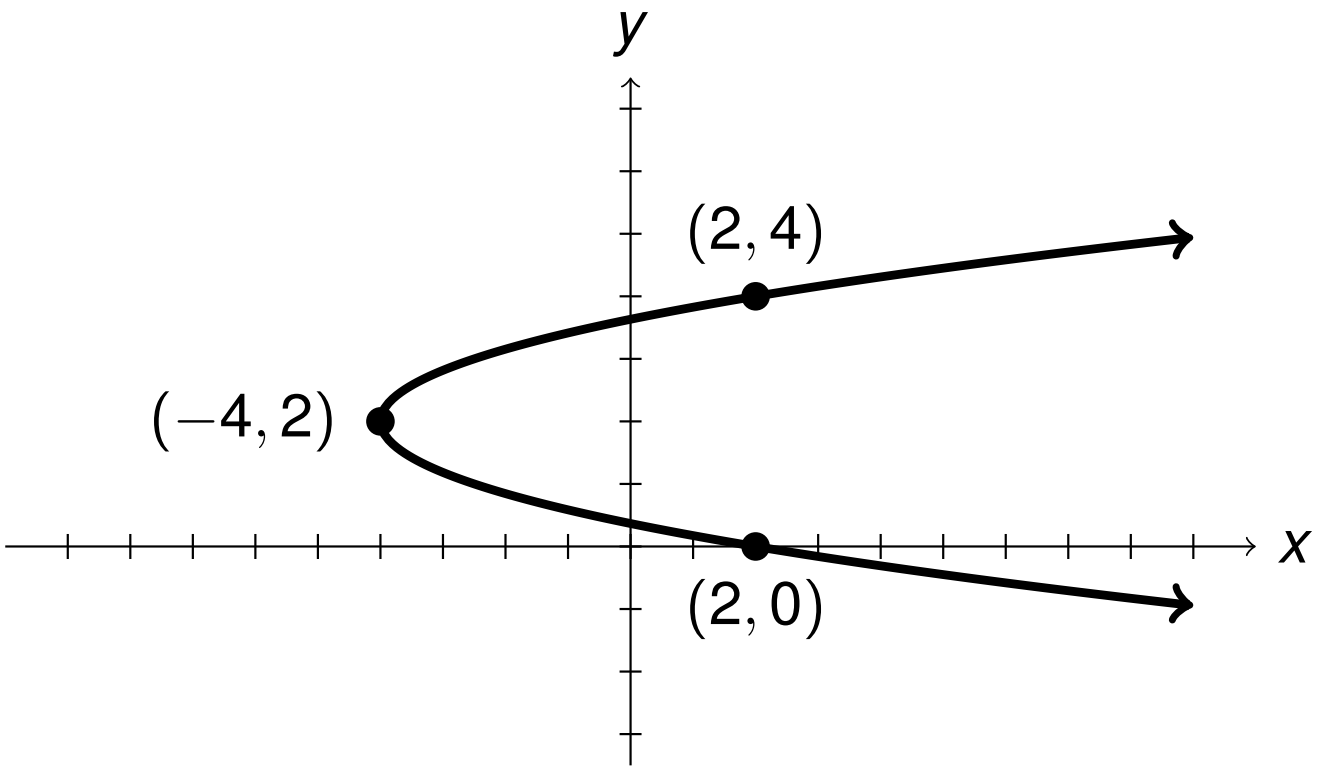


Example 3



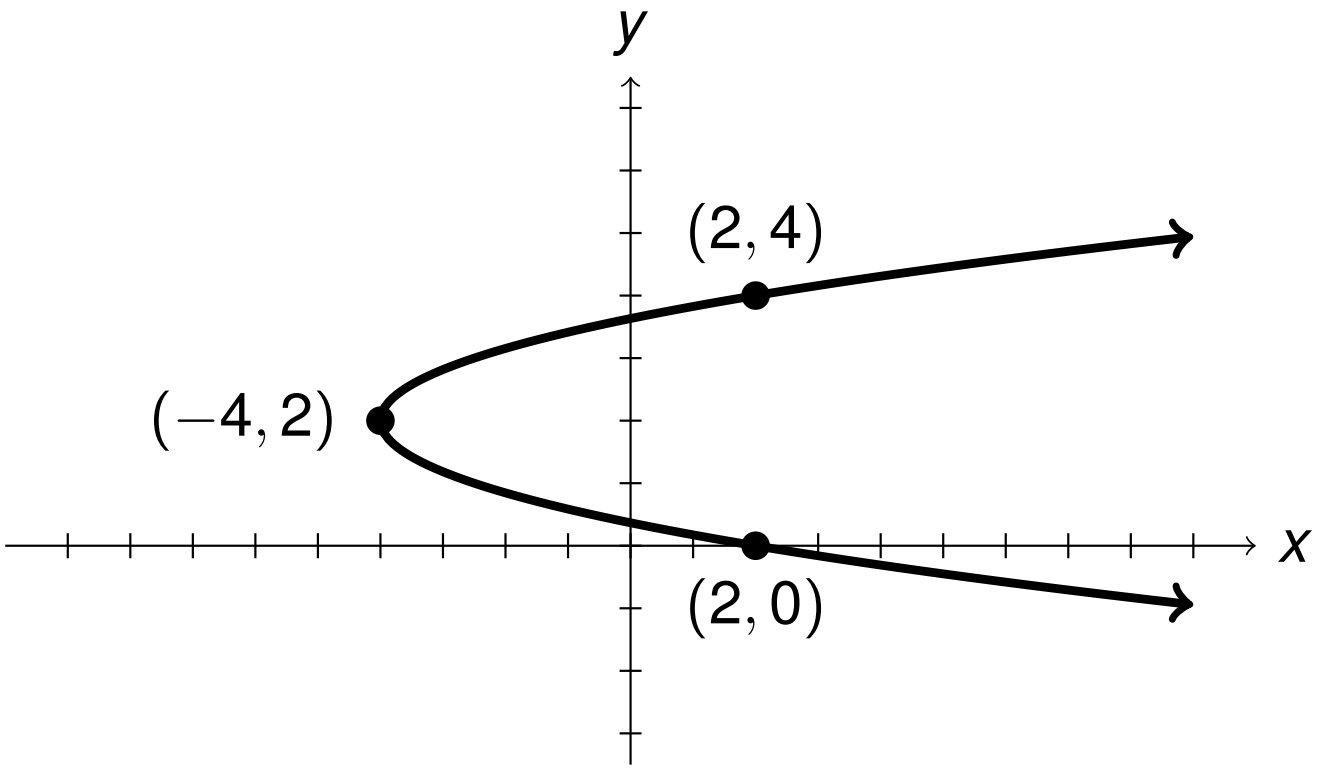
$$x - h = A(y - k)^2$$

Example 3



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

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

$y = x^2$	opens upward
$y = -x^2$	opens downward
$x = y^2$	opens to the right
$x = -y^2$	opens to the left

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

Credits

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