

## 3.2 Investigating Quadratic Functions in Standard Form

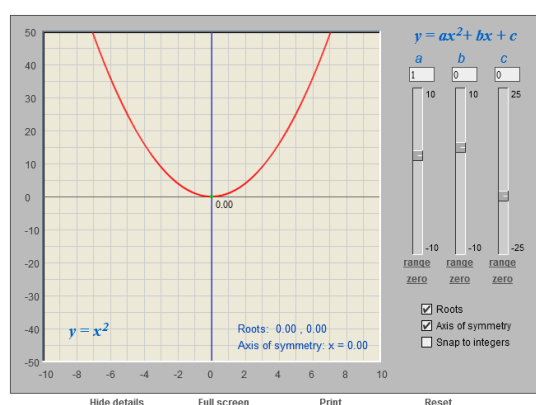
Vertex Form  $y = a(x - p)^2 + q$

Standard Form  $y = ax^2 + bx + c$

Convert from vertex form to standard form:

**Example:**  $y = 2(x - 3)^2 + 4$

### Investigating the Standard Form of Quadratic Functions



<http://www.mathopenref.com/quadraticexplorer.html>

OR

<https://www.desmos.com/>

## Standard Form of Quadratic Functions

- $a$  determines the shape and direction of opening
- $b$  influences the position of the graph
- $c$  determines the  $y$ -intercept of the graph

NOTE:

The  $y$ -intercept occurs when the  $x$ -value is 0.

**Example:**

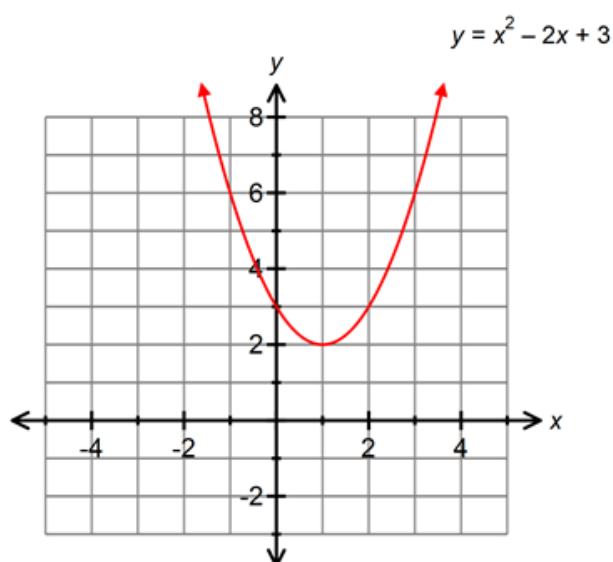
What is the  $y$ -intercept of  $y = 3x^2 + 9x - 2$  ?

## Vertex of a Quadratic Function in Standard Form

Example:

Identify the vertex.

Identify the parameters  $a$ ,  $b$ , and  $c$  from the equation.



How can we use the parameters to determine the vertex without using a graph.

## Example:

Determine the vertex for each of the following quadratic functions:

(i)  $y = 3x^2 - 6x + 10$

(ii)  $y = -2x^2 - 16x - 34$

(iii)  $y = x^2 - 4x + 7$

(iv)  $y = 2x^2 - 12x + 25$

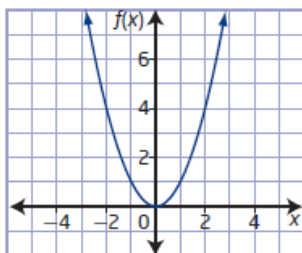
## Example 2 (Ex. 1, p. 166)

**Identify Characteristics of a Quadratic Function in Standard Form**

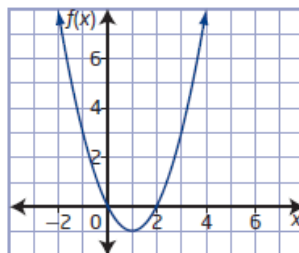
For each graph of a quadratic function, identify the following:

- the direction of opening
- the coordinates of the vertex
- the maximum or minimum value
- the equation of the axis of symmetry
- the x-intercepts and y-intercept
- the domain and range

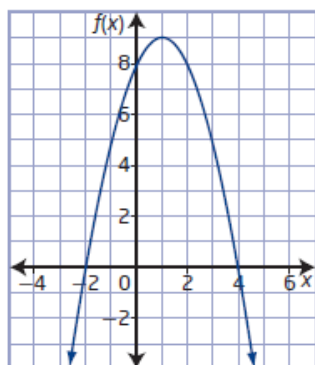
a)  $f(x) = x^2$



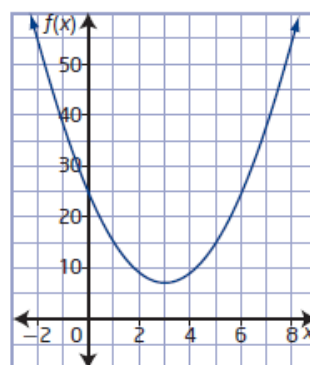
b)  $f(x) = x^2 - 2x$



c)  $f(x) = -x^2 + 2x + 8$



d)  $f(x) = 2x^2 - 12x + 25$

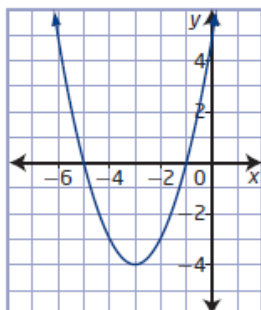


### Example 1: Your Turn

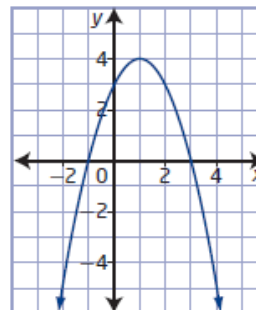
For each quadratic function, identify the following:

- the direction of opening
- the coordinates of the vertex
- the maximum or minimum value
- the equation of the axis of symmetry
- the x-intercepts and y-intercept
- the domain and range

a)  $y = x^2 + 6x + 5$

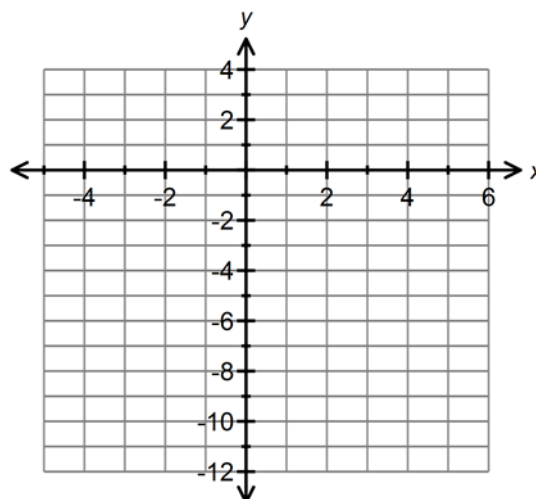


b)  $y = -x^2 + 2x + 3$



*Example:*

Sketch a graph of  $y = -2x^2 + 8x - 10$  and identify the vertex, the axis of symmetry, the direction of opening, the max or min value, the domain and range and the  $x$ -intercepts.

**Key Ideas p. 173***Assign:*

p. 174 – 176, #1, 2ab, 3, 4abc, 6, 8, 10, 23

**Dominos Activity**