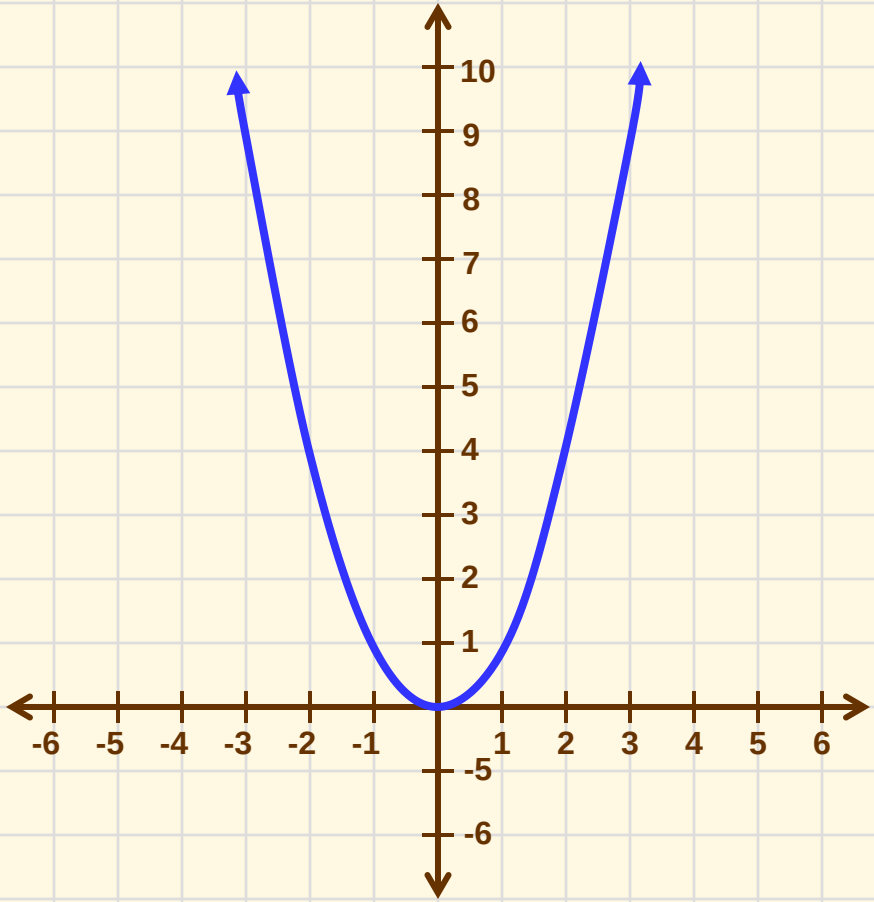
$f(x) = x^2$

- Let's review the basic graph of $f(x) = x^2$

x	$f(x) = x^2$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

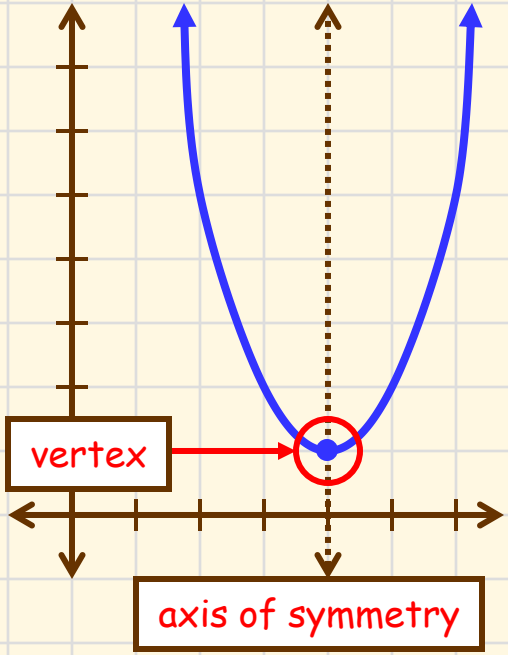


Standard Form

- The graphs of quadratic functions are parabolas
  - Standard form

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

  - If a > 0, the parabola opens upward
  - If a < 0, the parabola opens downward
  - Vertex => (h,k)
  - Axis of symmetry => x = h
  - h controls vertex movement left and right
  - k controls vertex movement up and down



- <u>Examples</u>:

Find the coordinates of the vertex for the given quadratic functions and give the axis of symmetry

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

Vertex:
Axis of symmetry:
Opens _____

$g(x) = 4(x-1)^2 + 3$

Vertex:
Axis of symmetry:
Opens _____

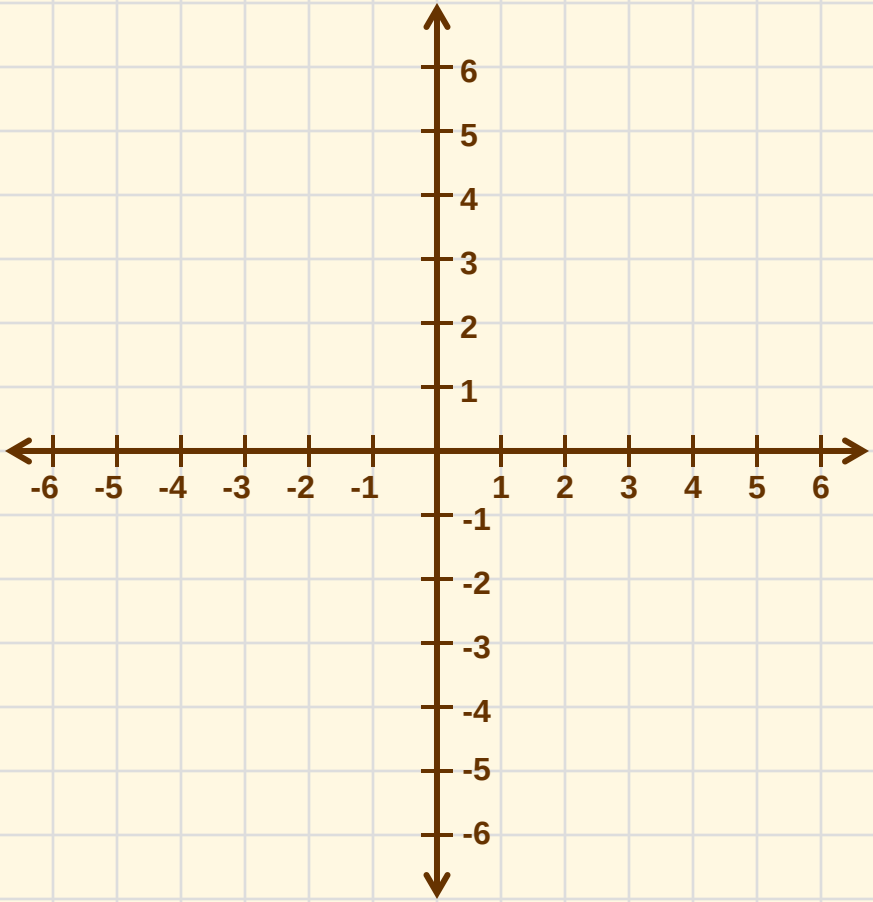
$h(x) = -(x+5)^2 - 1$

Vertex:
Axis of symmetry:
Opens _____

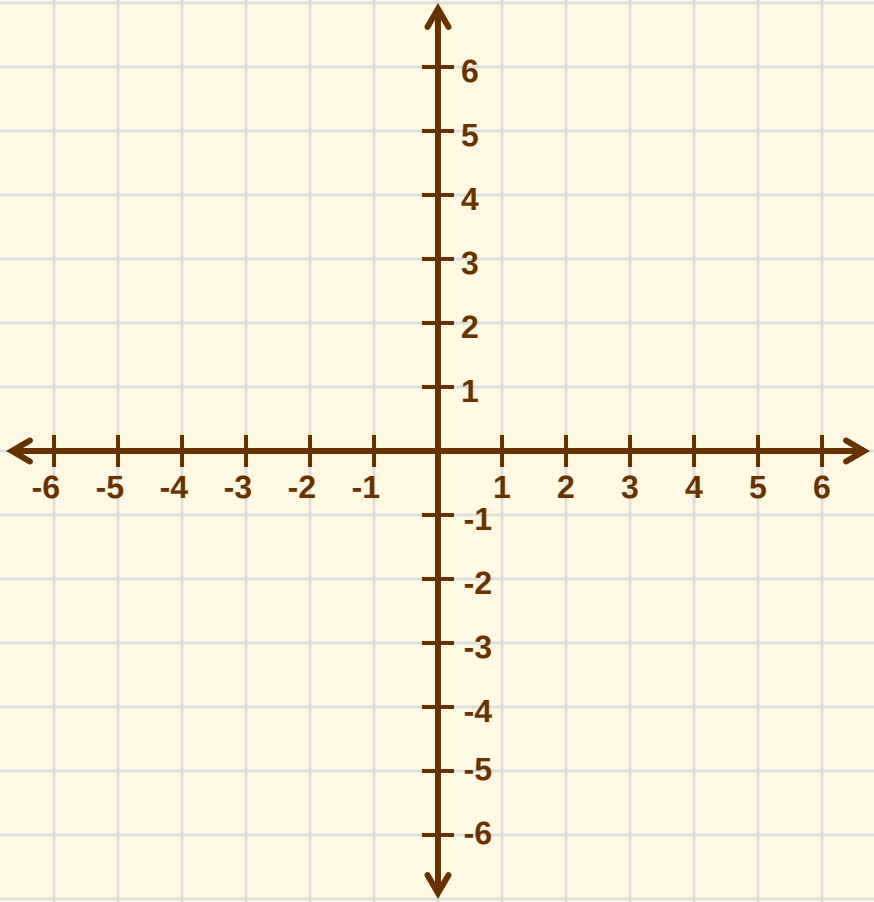
Examples

- Graph the quadratic function. Give the axis of symmetry, domain, and range of each function.

$f(x) = (x-2)^2 + 1$



$f(x) = -(x+1)^2 - 1$



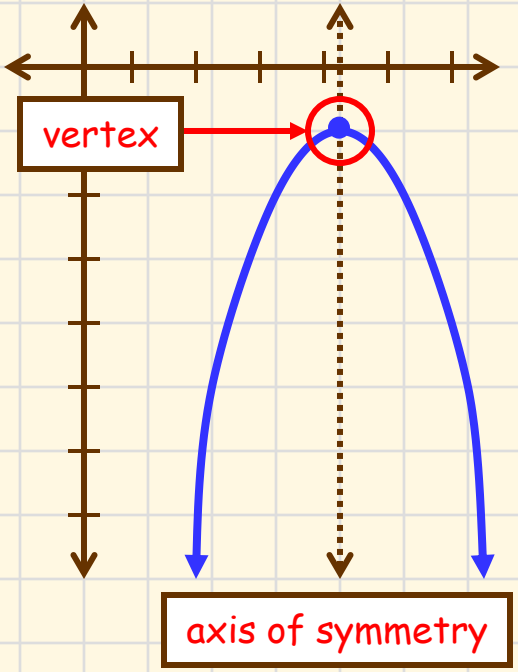
See pg 288 in the book for a 5-step guide to graphing quadratic functions in standard form

Another Form

- Another common form is used for parabolas as well

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

  - Functions of this form can be converted to standard form by completing the square
  - If a > 0, the parabola opens upward
  - If a < 0, the parabola opens downward
  - Vertex => $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$
  - Find x-intercepts by solving f(x) = 0
  - Find y-intercept by finding f(0)



- <u>Examples</u>:

Find the coordinates of the vertex for the given quadratic functions and give the x and y intercepts

$f(x) = x^2 + 16x + 60$

Vertex:
x-intercepts:
y-intercept:

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

Vertex:
x-intercepts:
y-intercept:

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

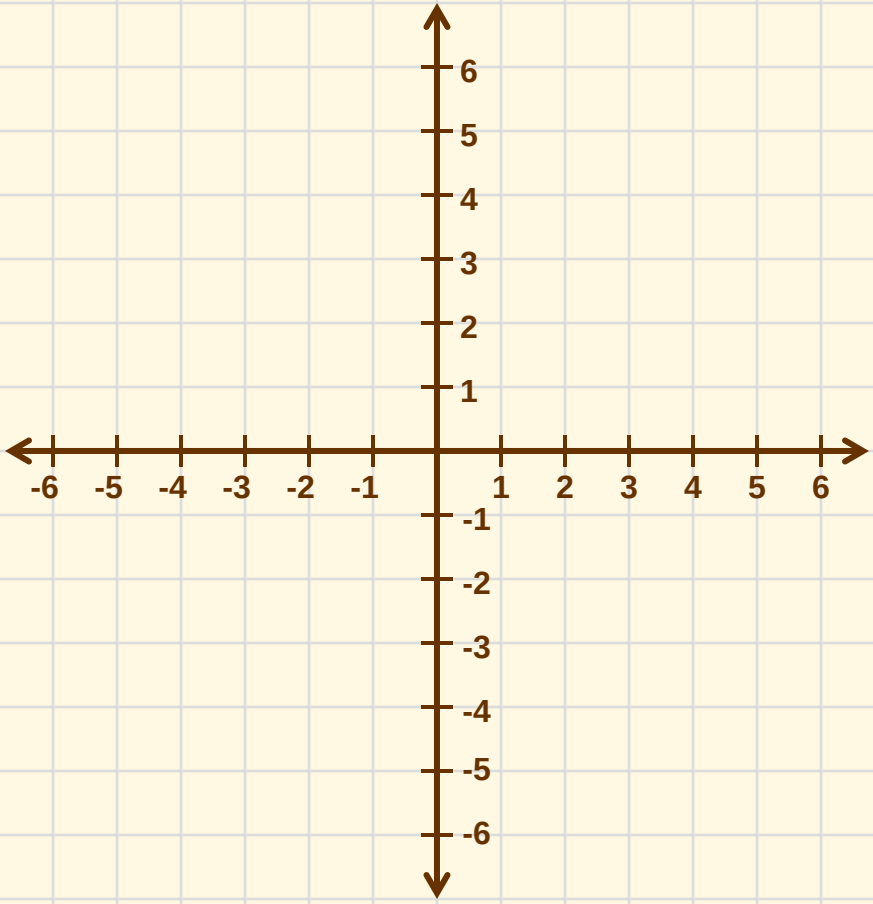
Vertex:
x-intercepts:
y-intercept:

Examples

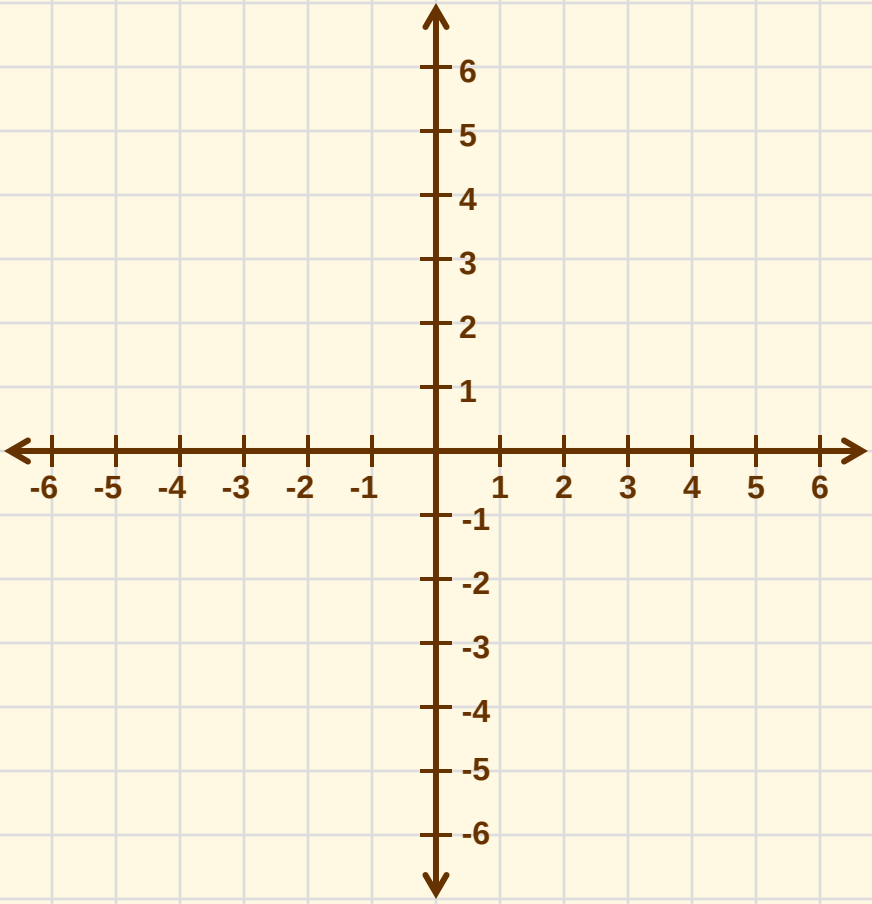
Book problems: 9,13,15,17,21,23,27,30,33,37

- Graph the quadratic function. Give the axis of symmetry, domain, and range of each function.

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



$f(x) = x^2 - 2x - 3$



See pg 292 in the book for a 5-step guide to graphing quadratic functions in standard form and applications