Chapter 2
Quadratic Functions

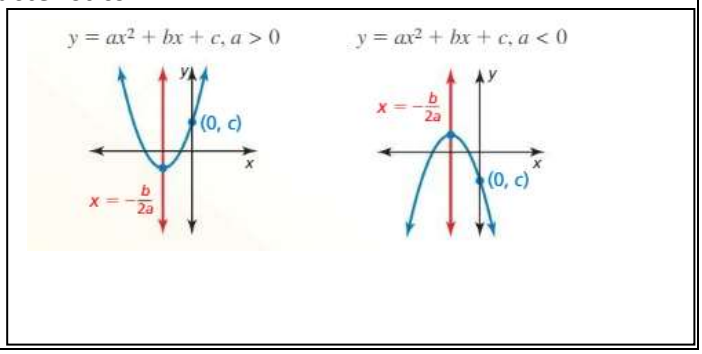
Section 2-2
Characteristics of Quadratic Functions

THE GRAPH OF A QUADRATIC FUNCTION

Standard Form

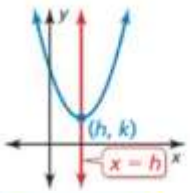
The graph $y = ax^2 + bx + c$ is a parabola with these characteristics.

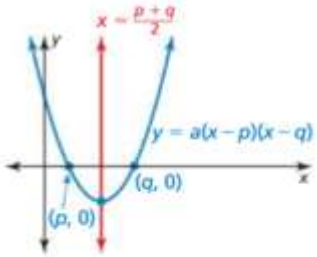
- The x-coordinate of the vertex is $-\frac{b}{2a}$.
- The axis of symmetry is the vertical line $x = -\frac{b}{2a}$



VERTEX AND INTERCEPT FORMS OF A QUADRATIC FUNCTION

FORM OF QUADRATIC FUNCTION	CHARACTERISTICS OF GRAPH
Vertex form $y = a(x-h)^2 + k$	The vertex is (h,k). The axis of symmetry is $x = h$.
Intercept form $y = a(x-p)(x-q)$	The x intercepts are p and q. The axis of symmetry is halfway between $(p,0)$ and $(q,0)$.

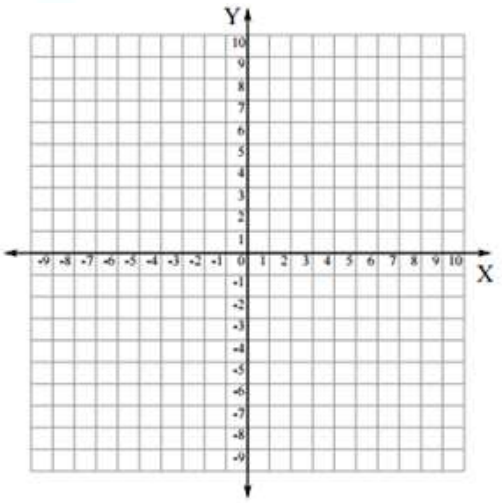




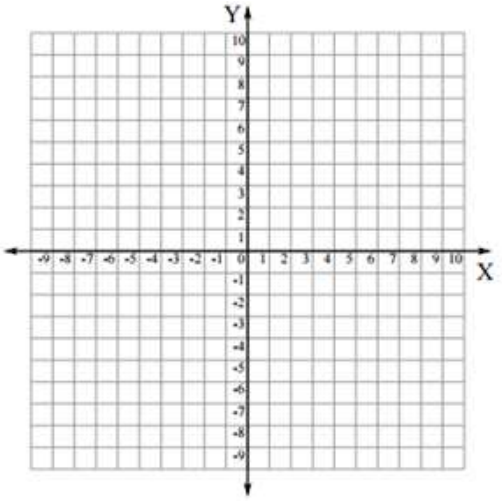
For both forms, the graph opens up if $a > 0$ and opens down if $a < 0$.

Graph the function. Label the vertex and axis of symmetry.

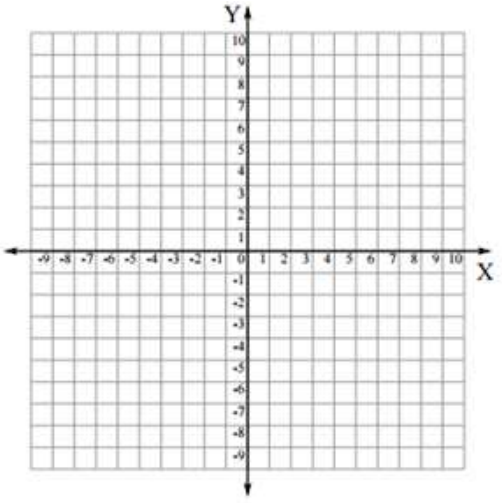
1. $f(x) = -3(x + 1)^2$
2. $g(x) = 2(x - 2)^2 + 5$
3. $h(x) = x^2 + 2x - 1$
4. $p(x) = -2x^2 - 8x + 1$



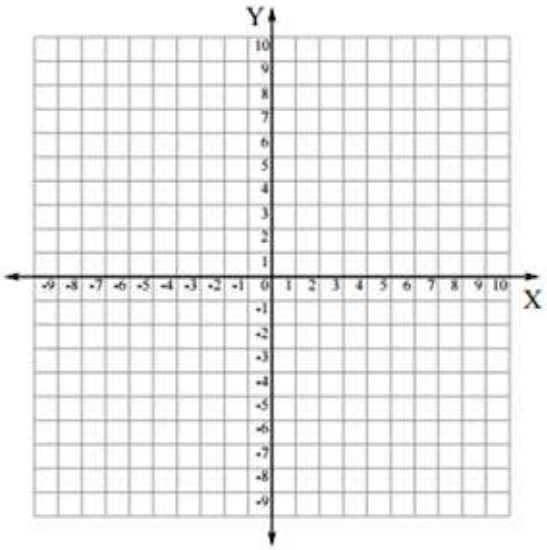
X	Y



X	Y



X	Y



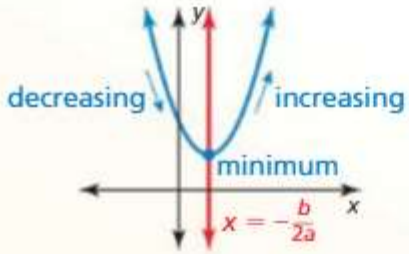
X	Y

Core Concept

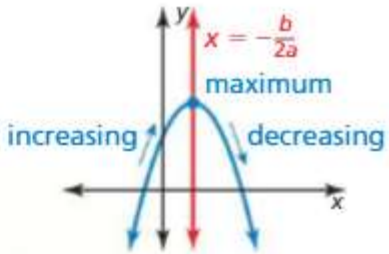
Minimum and Maximum Values

For the quadratic function $f(x) = ax^2 + bx + c$, the y-coordinate of the vertex is the **minimum value** of the function when $a > 0$ and the **maximum value** when $a < 0$.

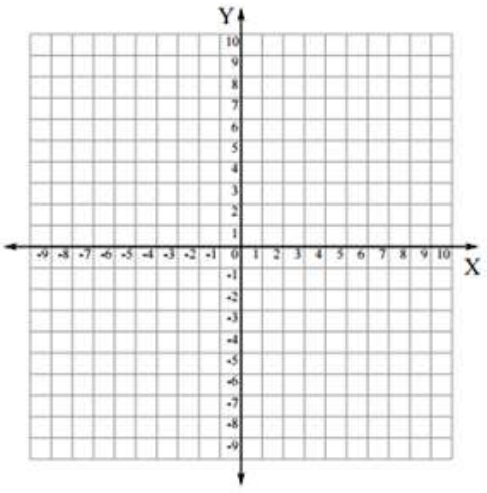
$a > 0$



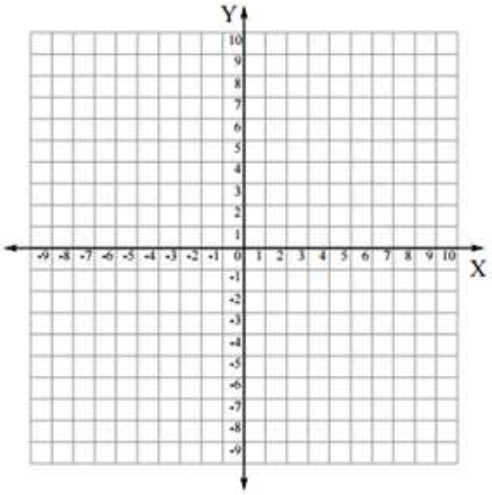
$a < 0$



5. Find the minimum value or maximum value of (a) $f(x) = 4x^2 + 16x - 3$ and (b) $h(x) = -x^2 + 5x + 9$. Describe the domain and range of each function, and where each function is increasing and decreasing.



X	Y

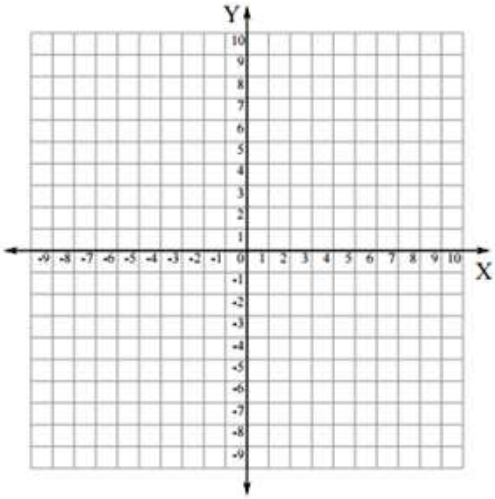


X	Y

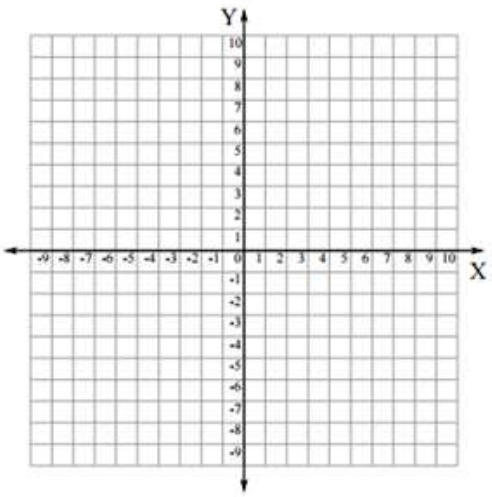
Graph the function. Label the x-intercepts, vertex, and axis of symmetry.

6. $f(x) = -(x + 1)(x + 5)$

7. $g(x) = \frac{1}{4}(x - 6)(x - 2)$



X	Y

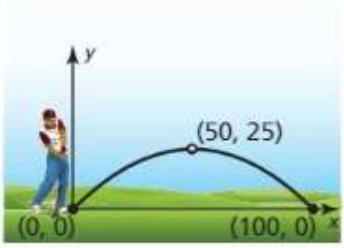


X	Y

Solving Real-Life Problems

Tutorial

EXAMPLE 5 **Modeling with Mathematics**



The parabola shows the path of your first golf shot, where x is the horizontal distance (in yards) and y is the corresponding height (in yards). The path of your second shot can be modeled by the function $f(x) = -0.02x(x - 80)$. Which shot travels farther before hitting the ground? Which travels higher?

Section 2-2 Homework #3,5,9,15,17,21,23,25,33,35,37,39,43,45,73,81