

Chapter 2 Quadratic Functions

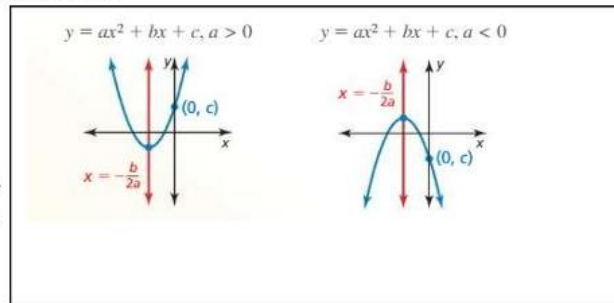
Section 2-2 Characteristics of Quadratic Functions

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

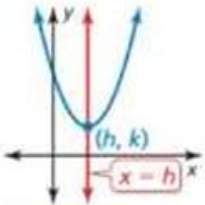
FORM OF QUADRATIC FUNCTION

CHARACTERISTICS OF GRAPH

Vertex form $y = a(x - h)^2 + k$

The vertex is (h, k) .

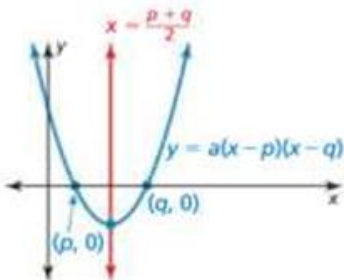
The axis of symmetry is $x = h$.



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 $(q, 0)$.

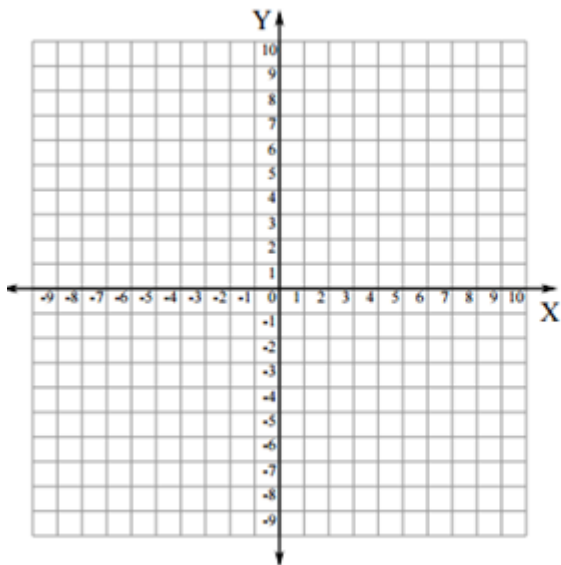
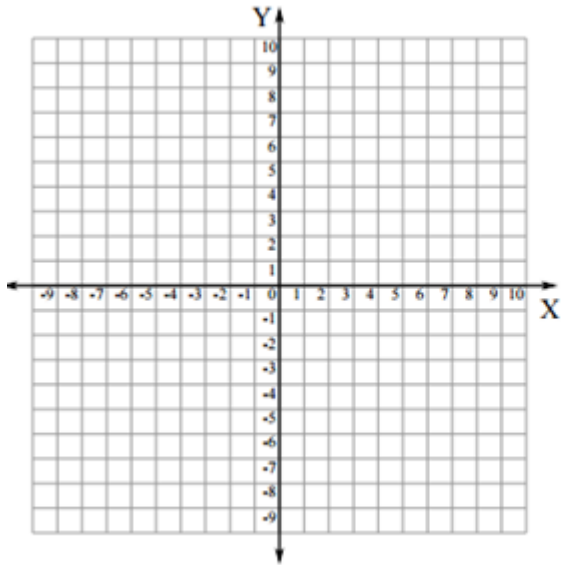


For both forms, the graph opens up if $a > 0$ and opens down if $a < 0$.

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

▶ 1. $f(x) = -3(x + 1)^2$

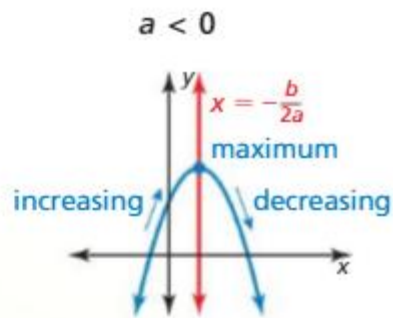
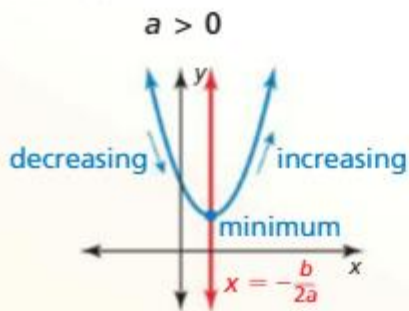
▶ 4. $p(x) = -2x^2 - 8x + 1$



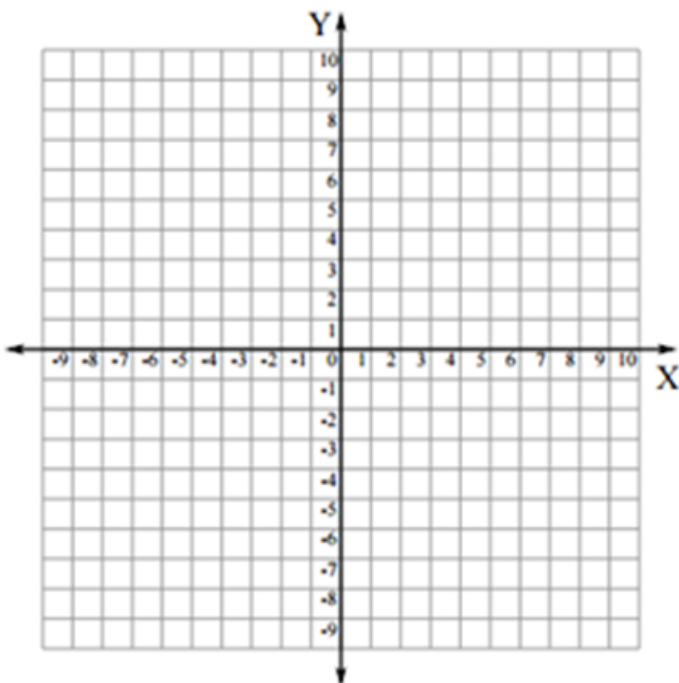
Core Concept

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 $a < 0$.



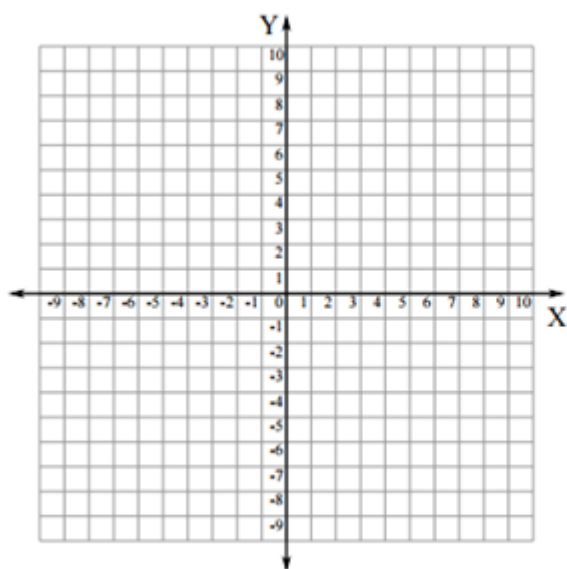
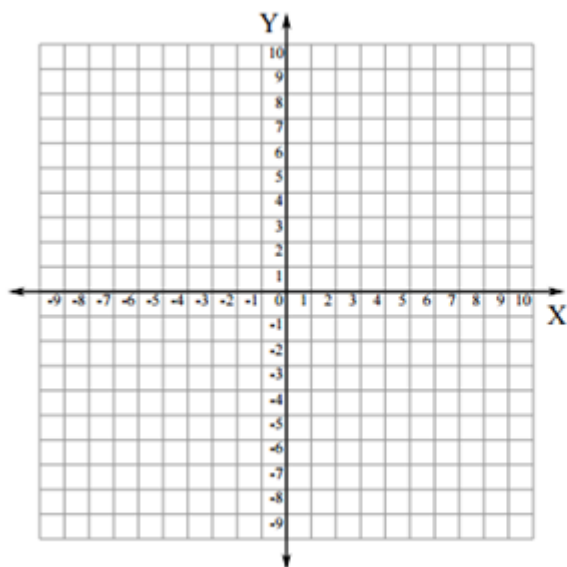
5. Find the minimum value or maximum value of (a) $f(x) = 4x^2 + 16x - 3$ and Describe the domain and range of each function, and where each function is increasing and decreasing.



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

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

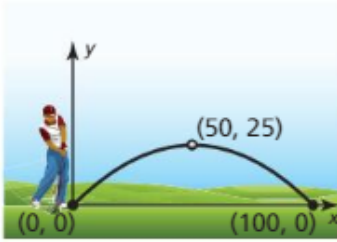
7. $g(x) = \frac{1}{4}(x - 6)(x - 2)$



Solving Real-Life Problems



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?