

Warm Up

Give the coordinate of the vertex of each function.

1. $f(x) = (x - 2)^2 + 3$ $(2, 3)$

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

3. Give the domain and range of the following function.

$$\{(-2, 4), (0, 6), (2, 8), (4, 10)\}$$

$$D:\{-2, 0, 2, 4\}; R:\{4, 6, 8, 10\}$$

Objectives

Define, identify, and graph quadratic functions.

Identify and use maximums and minimums of quadratic functions to solve problems.

Vocabulary

axis of symmetry

standard form

minimum value

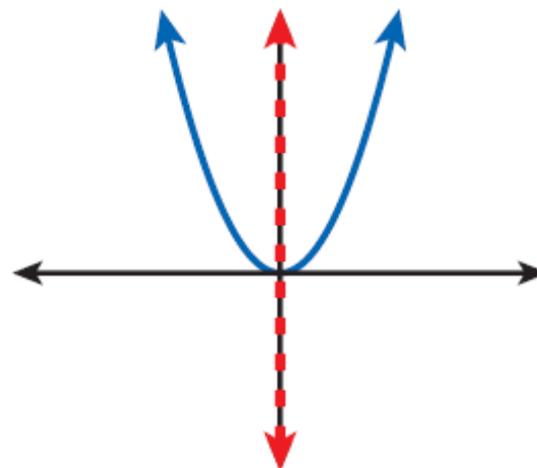
maximum value

2-2

Properties of Quadratic Functions in Standard Form

When you transformed quadratic functions in the previous lesson, you saw that reflecting the parent function across the y -axis results in the same function.

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



Helpful Hint

When a is positive, the parabola is happy (U).
When the a negative, the parabola is sad (\cap).

Example 2A: Graphing Quadratic Functions in Standard Form

Consider the function $f(x) = 2x^2 - 4x + 5$.

- a. Determine whether the graph opens upward or downward.**

Because a is positive, the parabola opens upward.

- b. Find the y -intercept.**

Because $c = 5$, the intercept is 5.

Example 2B: Graphing Quadratic Functions in Standard Form

Consider the function $f(x) = -x^2 - 2x + 3$.

- a. Determine whether the graph opens upward or downward.

Because a is negative, the parabola opens downward.

- b. Find the y -intercept.

Because $c = 3$, the y -intercept is 3.

Properties of Quadratic Functions in Standard Form

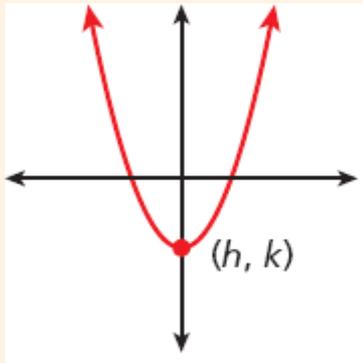
Minimum and Maximum Values

OPENS UPWARD

When a parabola opens upward, the y -value of the vertex is the **minimum value**.

$$D: \{x | x \in \mathbb{R}\}$$

$$R: \{y | y \geq k\}$$



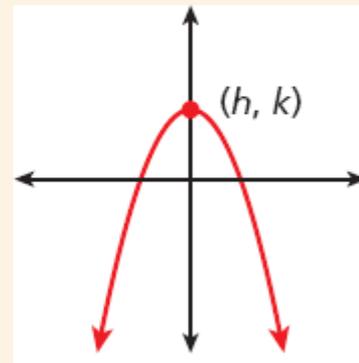
The domain is all real numbers, \mathbb{R} . The range is all values greater than or equal to the minimum.

OPENS DOWNWARD

When a parabola opens downward, the y -value of the vertex is the **maximum value**.

$$D: \{x | x \in \mathbb{R}\}$$

$$R: \{y | y \leq k\}$$



The domain is all real numbers, \mathbb{R} . The range is all values less than or equal to the maximum.