Section 4.1 Quadratic Functions

In section 3.3, we learned the graphs of eight basic functions, including the square function . The square function is the simplest quadratic function. 

# Review of Graphing Transformations of the Square Function

*LSU Video* ***“Quadratic Functions and Their Graphs”*** *(0:00 – 20:35) is found on the course website.*

See also Section 3.4.

# Review of Solving Quadratic Equations

Recall that in section 1.4, we learned three methods of solving a quadratic equation: factoring, using the square root property, and using the quadratic formula.

# Review of Evaluating Functions for Given Inputs

See Section 3.1.

# Objective 1: Understanding the Definition of a Quadratic Function and its Graph

**Definition:** A **quadratic function** is a function that can be written in the form  where *a*, *b*, and *c* arereal numbers with  Every quadratic function has a “u-shaped” graph called a *parabola*.

The five basic characteristics of a parabola are its

1. vertex
2. axis of symmetry
3. *y*-intercept
4. *x*-intercept(s) or real zeros, and
5. domain and range.

The domain of a quadratic function is .

The parabola *opens up* if , so the function has a minimum value at the vertex. That minimum value is the *y*-coordinate of the vertex.

The parabola *opens down* if , so the function has a maximum value at the vertex. That maximum value is the *y*-coordinate of the vertex.

The *x*-intercept(s), if any, are found by solving the equation . The *y*-intercept is .

# Objective 2: Graphing Quadratic Functions Written in Vertex Form

**Vertex Form of a Quadratic Function**

A quadratic function is in **vertex form** if it is written as.

The vertex of the parabola is .

 The line  is the axis of symmetry.

 The range is  if a > 0, and the range is  if a < 0.

 

# Objective 4: Graphing Quadratic Functions Using the Vertex Formula

**Formula for the Vertex of a Parabola**

Given a quadratic function of the form, the vertex of the parabola is .

# Objective 5: Determining the Equation of a Quadratic Function Given its Graph