Section 1.4 Quadratic Equations

In Section 1.1 we studied linear equations of the form. These equations are also known as 1st order polynomial equations. In this section, we will learn how to solve 2nd order polynomial equations. Second order polynomial equations are called **quadratic equations***.*

***Definition*:** A **Quadratic Equation** **in One Variable** is an equation that can be written in the form. Quadratic equations in this form are said to be in *standard form.*

# Objective 1: Solving Quadratic Equations by Factoring and the Zero Product Property

Some quadratic equations can be easily **solved by factoring** and by using the following important property.

**The Zero Product Property:** If  then  or.

The zero product property says that if two factors multiplied together are equal to zero, then at least one of the factors must be zero.

# Objective 2: Solving Quadratic Equations using the Square Root Property

Any quadratic equation of the form  where  can be solved by factoring the left side as  thus the solutions are. Quadratic equations of this form can be more readily solved by using the following **square root property**.

**The Square Root Property:** The solution to the quadratic equation, or equivalently, is.

# Objective 4: Solving Quadratic Equations Using the Quadratic Formula

The **quadratic formula** can be used to solve any quadratic equation.

**The Quadratic Formula:** The solution to the quadratic equation  is given by the formula.

# Objective 5: Using the Discriminant to Determine the Type of Solutions of a Quadratic Equation

Given a quadratic equation of the form, the expression  is called the **discriminant**. Knowing the value of the discriminate can help us determine the number and nature of the solutions to a quadratic equation.

**The Discriminant:** Given a quadratic equation, the expression

 is called the **discriminant**.

If, then the quadratic equation has two real solutions.

 If, then the quadratic equation has two non-real solutions.

 If, then the quadratic equation has exactly one real solution.