Section 9.2 Solving Quadratic Equations by the Quadratic Formula

# Objective 1: Solving Quadratic Equations by Using the Quadratic Formula

Any quadratic equation can be solved by completing the square. By completing the square for a general quadratic equation , we derive the **quadratic formula**.

Because the quadratic formula is derived by completing the square, it can be used to solve any quadratic equation written in standard form.

**Quadratic Formula:**

A quadratic equation written in the form has the solutions .

Use the quadratic formula to solve the equation. Give the answers in exact form using simplified radicals and as needed.

|  |  |
| --- | --- |
| a.  | b.  |

# Objective 2: Using the Discriminant

In the quadratic formula, the value of the radicand, , tells us the number and type of solutions of the corresponding quadratic equation. This value is called the **discriminant.**

**Discriminant:**

For a quadratic equation of the form ,

* when , the quadratic equation has two real solutions.
* when , the quadratic equation has one real solution.
* when , the quadratic equation has two complex, nonreal solutions.

a. Determine the number and types of solutions of the quadratic equation .

Recall that the solution(s) of the quadratic equation correspond to the -intercept(s) of the graph of the quadratic function when the solutions are real numbers.

**Graph of :**

* When , the graph of has two -intercepts.
* When , the graph of has one -intercept.
* When , the graph of has no -intercepts.

b. Determine the number of -intercepts of the graph of .

# Objective 3: Solving Problems Modeled by Quadratic Equations

The quadratic formula can be useful in solving problems that are modeled by quadratic equations.

a. The base of a triangle is eight more than twice its height. If the area of the triangle is square centimeters, find its base and height.

b. A ball is thrown downward from the top of a -foot building with an initial velocity of feet per second. The height of the ball after seconds is given by the equation . How long after the ball is thrown will it strike the ground?