

Day 9 – Quadratic Formula & Applications

If a , b , and c are real numbers such that $a \neq 0$, then a **quadratic equation** is an equation that can be written in the form

$$ax^2 + bx + c = 0$$

PROPERTY Zero Product Rule

If $ab = 0$, then $a = 0$ or $b = 0$.

FORMULA The Quadratic Formula

Given a quadratic equation, $ax^2 + bx + c = 0$ ($a \neq 0$), the solutions are:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

FORMULA The Discriminant

Consider a quadratic equation $ax^2 + bx + c = 0$ where $a \neq 0$ and a , b , and c are real numbers. The radicand within the quadratic formula is called the **discriminant**.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The **discriminant** is $b^2 - 4ac$.

SUMMARY Using the Discriminant to Determine the Number and Type of Solutions to a Quadratic Equation

Case 1: If $b^2 - 4ac > 0$, there will be two real solutions.

- If $b^2 - 4ac$ is a perfect square, the solutions will be rational numbers.
- If $b^2 - 4ac$ is not a perfect square, the solutions will be irrational numbers.

Case 2: If $b^2 - 4ac < 0$, there will be two imaginary solutions.

Case 3: If $b^2 - 4ac = 0$, there will be one rational solution.

Pythagorean Theorem

If a and b represent the lengths of the two legs in a right triangle, and c represents the length of the hypotenuse, then

$$a^2 + b^2 = c^2$$

