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The Quadratic Formula and the Discriminant

Unit 9 Lesson 5

THE QUADRATIC FORMULA AND THE DISCRIMINANT

Students will be able to:

Understand how to solve quadratic equations
using quadratic formula

Key Vocabulary:

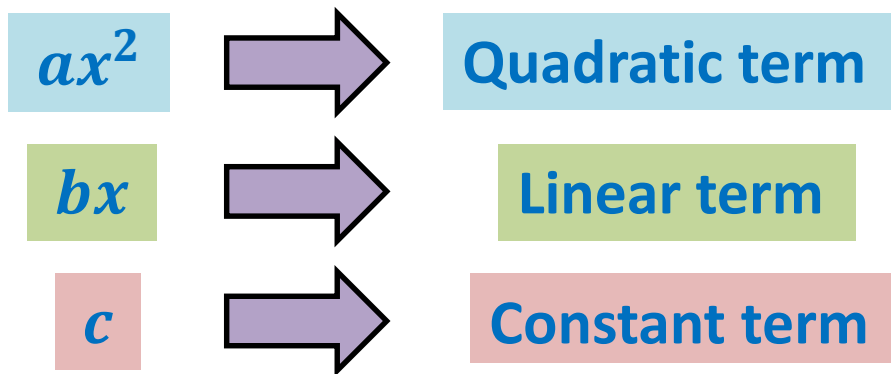
- Quadratic Equation
- Quadratic Formula
- Discriminant

THE QUADRATIC FORMULA AND THE DISCRIMINANT

A **quadratic equation** is of the form:

$$f(x) = ax^2 + bx + c = 0$$

Where, $a \neq 0$.



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Quadratic Formula

The quadratic formula can be used to find the solutions of a quadratic equation $ax^2 + bx + c = 0$.

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

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Problem 1: Find all the solutions of the quadratic equation $2x^2 + 5x - 4 = 0$.

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Here $a = 2$, $b = 5$, $c = -4$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \Rightarrow \quad x = \frac{-5 \pm \sqrt{5^2 - 4(2)(-4)}}{2(2)}$$

$$x = \frac{-5 \pm \sqrt{25 + 32}}{4} \quad = \quad x = \frac{-5 \pm \sqrt{57}}{4}$$

$$\Rightarrow x = \frac{-5 + \sqrt{57}}{4} \quad \Rightarrow \quad x = \frac{-5 - \sqrt{57}}{4}$$

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Discriminant of a Quadratic Equation

The discriminant of a quadratic equation $ax^2 + bx + c = 0$ is the value of $b^2 - 4ac$.

The value of the discriminant can predict the type and the number of solutions of a quadratic equation.

Value of $b^2 - 4ac$	Number of solutions	Type of solutions
Positive	2	Real
Zero	1	Real
Negative	2	Complex

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Problem 2: Find the discriminant of the quadratic equation $2x^2 + 5x - 4$ and tell the number and type of solutions this equation has.

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Here $a = 2$, $b = 5$, $c = -4$,

$$b^2 - 4ac \rightarrow 5^2 - 4(2)(-4) = 25 + 32$$

$$\rightarrow 25 + 32 = 57 > 0$$

Since the discriminant is positive, the quadratic equation has **two real** solutions.