Chapter No 4

Quadratic Equations

Quadratic Equation

An equation containing one or more terms in which the variable is raised to maximum positive power two. In general:

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

where \( a \neq 0 \) is called Quadratic Equation in variable \( x \).

3 Methods.

To solve Quadratic Equation there are three different methods named as:

1. Factorization method.
2. Completing Square method.
3. Quadratic Formula method.

Example 1

Solve \( x^2 - 7x + 10 = 0 \)

\( x^2 - 2x - 5x + 10 = 0 \)

\( x(x-2) - 5(x-2) = 0 \)

\( (x-2)(x-5) = 0 \)

\( x = 2, 5 \)

\( \Rightarrow x = 1 \) is incorrect.

Example 2

Solve \( x^2 + 4x - 437 = 0 \) by Completing Squares

\( x^2 + 4x = 437 \)

Adding \( (\frac{4}{2})^2 = 4 \) on both sides.

\( x^2 + 4x + (\frac{4}{2})^2 = 437 + (\frac{4}{2})^2 \)

\( (x + 2)^2 = 437 + 4 \)

\( (x + 2)^2 = 441 \)

\( x + 2 = \pm 21 \)

\( x = 21 - 2, 21 + 2 \)

\( x = 19, 23 \)

\( \{ 19, 23 \} \)

Example 3

Solve \( 6x^2 + x - 15 = 0 \) by Q. Formula

Comparing \( ax^2 + bx + c = 0 \)

we have \( a = 6, b = 1, c = -15 \)

By using Quadratic Formula.

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

\( x = \frac{-1 \pm \sqrt{1^2 - 4(6)(-15)}}{2(6)} \)

\( x = \frac{-1 \pm \sqrt{1 + 360}}{12} \Rightarrow x = \frac{-1 \pm \sqrt{361}}{12} \)

\( x = \frac{-1 \pm 19}{12} \)

\( x = -1 \pm 19 \)

\( x = 18, -20 \)

\( \{ 18, -20 \} \)

Example 4

Solve \( 3x^2 - 14x - 15 = 0 \) by Quadratic Formula

Comparing \( ax^2 + bx + c = 0 \)

we have \( a = 3, b = -14, c = -15 \)

By using Quadratic Formula:

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

\( x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(3)(-15)}}{2(3)} \)

\( x = \frac{14 \pm \sqrt{196 + 180}}{6} \Rightarrow x = \frac{14 \pm \sqrt{376}}{6} \)

\( x = \frac{14 \pm 26}{6} \)

\( \sqrt{376} = 6.1 \)

\( x = \frac{14 \pm 2.6}{6} \)

\( x = \frac{14 + 2.6}{6}, \ x = \frac{14 - 2.6}{6} \)

\( x = \frac{16.6}{6}, x = \frac{11.4}{6} \)

\( x = \frac{5}{3}, x = \frac{3}{2} \)

\( \{ \frac{5}{3}, \frac{3}{2} \} \)