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 these are three different methods named as;
1. Factorization method.
2. Completing Square method.
3. Quadratic Formula method.

Example 1

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

\[ x^2 - 2x - 5x + 10 = 0 \]
\[ x(x-2) - 5(x-2) = 0 \]
\[ (x-2)(x-5) = 0 \]
\[ x-2 = 0 \quad \text{or} \quad x-5 = 0 \]
\[ x = 2 \quad \text{or} \quad x = 5 \]
\[ \{ 2, 5 \} \]

Example 2

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

\[ x^2 + 4x = 437 \]

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

\[ x^2 + 4x + 4 = 437 + 4 \]
\[ (x + 2)^2 = 441 \]
\[ x + 2 = \pm 21 \]
\[ x = 21 - 2 \quad \text{or} \quad x = -21 - 2 \]
\[ x = 19 \quad \text{or} \quad x = -23 \]
\[ \{ 19, -23 \} \]

Example 3

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

Comparing \( 6x^2 + x - 15 = 0 \)

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

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

By using Quadratic Formula.

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

\[ x = \frac{-1 \pm \sqrt{1 + 4(6)(-15)}}{12} \quad \Rightarrow \quad x = \frac{-1 \pm \sqrt{361}}{12} \]

\[ x = \frac{-1 \pm 19}{12} \quad \Rightarrow \quad x = \frac{-1 \pm 19}{12} \]

\[ x = \frac{-20}{12} \quad \text{or} \quad x = \frac{18}{12} \]

\[ x = \{-\frac{5}{3}, \frac{3}{2}, \frac{5}{3} \} \]

Example 4

Solve \( 8x^2 - 14x - 15 = 0 \) by Quadratic For

Comparing \( 8x^2 - 14x - 15 = 0 \)

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

We have \( a = 8, b = -14, c = -15 \)

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

\[ x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(8)(-15)}}{2(8)} \]

\[ x = \frac{14 \pm \sqrt{196 + 480}}{16} \quad \Rightarrow \quad x = \frac{14 \pm \sqrt{676}}{16} \]

\[ x = \frac{14 \pm 26}{16} \quad \Rightarrow \quad \sqrt{676} = 26 \]

\[ x = \frac{40}{16} \quad \text{or} \quad x = \frac{-12}{16} \]

\[ x = \frac{5}{2}, x = -\frac{3}{4} \]

\[ \{ \frac{5}{2}, -\frac{3}{4} \} \]