Nature of roots of quadratic Equation

→ The nature of roots of quadratic equation $ax^2+bx+c=0$, $a\neq 0$ depends upon the value of the expression $\Delta = b^2-4ac$, called the discriminant.

→ There are some cases.

Cas-I

when $\Delta > 0$ and not a perfect square, the roots are unequal & irrational

Case-II

when $\Delta > 0$ and perfect square, the roots are unequal & rational

case-III

when $\Delta = 0$, the roots are rational and equal

case-IV

when $\Delta < 0$, the roots are unequal & imaginary.

Example 1

Write the nature of roots of $2x^2+3x-5=0$

S-1

$a=2,\ b=3,\ c=-5$

Formula

$$\Delta = b^2-4ac$$
$$=(3)^2-4(2)(-5)$$
$$=9+40$$
$$\Delta = 49$$

This is perfect square

$$\Delta = (7)^2 > 0$$

so, roots are unequal & rational

Example 2

$$2x^2+3x-4=0$$

$a=2,\ b=3,\ c=-4$

Formula

$$\Delta = b^2-4ac$$
$$=(3)^2-4(2)(-4)$$
$$=9+32$$
$$=41 > 0$$

So roots are irrational & unequal

Example 3

$$2x^2+3x+5=0$$

$a=2,\ b=3,\ c=5$

Formula

$$\Delta = b^2-4ac$$
$$=(3)^2-4(2)(5)$$
$$=9-40$$
$$\Delta = -31 < 0$$

So roots are unequal & imaginary

Example - 4

$$2x^2-4x+2=0$$

$a=2,\ b=-4,\ c=2$

Formula

$$\Delta = b^2-4ac$$
$$=(-4)^2-4(2)(2)$$
$$=16-16$$
$$\Delta = 0$$

So roots are rational & equal