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(Affiliated to CBSE up to +2 Level)

CLASS: X

SUB.: MATHS (NCERT BASED)

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Chapter 4:- Quadratic Equations

Ex 4.4

Question 1. Find the nature of the roots of the following quadratic equations. If the real roots exist, find them:

(i) $2x^2 - 3x + 5 = 0$

(ii) $3x^2 - 4\sqrt{3}x + 4 = 0$

Solution: -

(i) Given: $2x^2 - 3x + 5 = 0$

Here, $a = 2$, $b = -3$ and $c = 5$.

$$\begin{aligned}\therefore \text{Discriminant, } D &= b^2 - 4ac \\ &= (-3)^2 - 4 \times 2 \times 5 \\ &= 9 - 40 = -31 < 0\end{aligned}$$

Hence, the roots are **imaginary**.

(ii) Given: $3x^2 - 4\sqrt{3}x + 4 = 0$

Here, $a = 3$, $b = -4\sqrt{3}$ and $c = 4$.

$$\begin{aligned}\therefore \text{Discriminant, } D &= b^2 - 4ac \\ &= (-4\sqrt{3})^2 - 4 \times 3 \times 4 \\ &= 48 - 48 = 0\end{aligned}$$

Hence, the roots are **real** and **equal**.

Now using the formula,

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \text{ we get:} \\ x &= \frac{-(-4\sqrt{3}) \pm \sqrt{(-4\sqrt{3})^2 - 4 \times 3 \times 4}}{2 \times 3} \\ &= \frac{4\sqrt{3} \pm \sqrt{48 - 48}}{6} = \frac{4\sqrt{3}}{6} = \frac{2}{\sqrt{3}}\end{aligned}$$

Hence. The equal roots are $\frac{2}{\sqrt{3}}$ & $\frac{2}{\sqrt{3}}$ **Answer**

Do Your Self

(iii) $2x^2 - 6x + 3 = 0$

Question 2. Find the values of k for each of the following quadratic equations, so that they have two equal roots.

(i) $2x^2 + kx + 3 = 0$

Solution:

(i) $2x^2 + kx + 3 = 0$

This is of the form $ax^2 + bx + c = 0$,

where, $a = 2, b = k$ and $c = 3$

Discriminant, $D = b^2 - 4ac$
 $= k^2 - 4 \times 2 \times 3 = k^2 - 24$

For equal roots,

$$D = 0$$

$$\Rightarrow k^2 - 24 = 0$$

$$\Rightarrow k^2 = 24 \text{ or } k = \pm\sqrt{24}$$

$$\Rightarrow k = \pm\sqrt{4 \times 6} = \pm 2\sqrt{6}$$

Answer

(ii) $kx(x - 2) + 6 = 0$

Solution:

(ii) $kx(x - 2) + 6 = 0$

$$\Rightarrow kx^2 - 2kx + 6 = 0$$

This is of the form $ax^2 + bx + c = 0$,

where $a = k, b = -2k$ and $c = 6$

Discriminant, $D = b^2 - 4ac$
 $= (-2k)^2 - 4 \times k \times 6 = 4k^2 - 24k$

For equal roots, $D = 0$

$$\Rightarrow 4k^2 - 24k = 0 \Rightarrow k(4k - 24) = 0$$

$$\Rightarrow k = 0 \text{ (not possible) or } 4k - 24 = 0$$

$$\Rightarrow 4k = 24$$

$$\Rightarrow k = \frac{24}{4} = 6 \quad \therefore k = 6 \text{ Answer}$$