CLASS 10

MATHS

QUADRATIC EQUATION

EQUATIONS REDUCIBILE TO QUADRATIC EQUATIONS

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Type 1: Equations of the form $ax^4 + bx^2 + c = 0$,

Method : Substitute $x^2 = y$ and solve.

Ex. 1 Solve the following equations :

(i)
$$x^4 - 26x^2 + 25 = 0$$

(ii)
$$z^4 - 10z^2 + 9 = 0$$

Sol.(i) Substituting $x^2 = y$:

$$x^{4} - 26x^{2} + 25 = 0$$

$$\Rightarrow y^{2} - 26y + 25 = 0$$

$$\Rightarrow y(y - 25) - 1(y - 25) = 0$$

$$\Rightarrow y - 25 = 0 \text{ or } y - 1 = 0$$

$$y = 25 \Rightarrow x^{2} = 25$$

$$y = 1 \Rightarrow x^{2} = 1$$

$$\Rightarrow x = \pm 1$$

$$y = 25 \Rightarrow x^{2} = 1$$

$$y = 25 \Rightarrow x^{2} = 1$$

$$x = \pm 1$$

 \therefore Roots of the given equation are : $\pm 5, \pm 1$

(ii) Substituting
$$z^2 = x$$

 $z^4 - 10z^2 + 9 = 0$
 $\Rightarrow x^2 - 10x + 9 = 0$
 $\Rightarrow x(x - 9) - 1 (x - 9) = 0$
 $x - 9 = 0$ or $x - 1 = 0$
 $x = 9$
 $x = 1$
 $x = 2$
 $x = 1$
 $z^2 = 1$
 $z = \pm 3$
 $z = \pm 3$

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Type 2: Equation of the form : $px + \frac{q}{x} = r$ **Method :** (i) Multiply each term by x. (ii) Solve the quadratic equation obtained to get the non-zero value(s) of x. Ex. 2 Solve : (i) $x + \frac{5}{x} = 6$ (ii) $3y + \frac{5}{16y} = 2$ Sol. (i) $x + \frac{5}{x} = 6$ $\Rightarrow x^2 + 5 = 6x$ [Multiplying each term by x] $\Rightarrow x^2 - 6x + 5 = 0$ $\Rightarrow x^2 - 5x - x + 5 = 0$ i.e., x(x - 5) - 1(x - 5) = 0 \Rightarrow (x - 5) (x - 1) = 0 i.e., x - 5 = 0 or $x - 1 = 0 \implies x = 5$ or x = 1. Required solution is 5, 1 $3y + \frac{5}{16y} = 2$ (ii) \Rightarrow 3y × 16y + 5 = 2 × 16y $\Rightarrow 48v^2 - 32v + 5 = 0$ $\Rightarrow 48y^2 - 12y - 20y + 5 = 0$ i.e., 12y(4y - 1) - 5(4y - 1) = 0 \Rightarrow (4y-1) (12y - 5) = 0 i.e., 4y - 1 = 0 or 12y - 5 = 0 $\Rightarrow 4y = 1 \text{ or } 12y = 5$ i.e., $y = \frac{1}{4} \text{ or } y = \frac{5}{12}$ \therefore Required solutions is : $\frac{1}{4}$, $\frac{5}{12}$

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Type 3 : Equations involving one radical :

$$\sqrt{a}-x^2 = bx + c$$

Method :

- 1. Square both the sides to get : $a x^2 = (bx + c)^2$
- 2. Now simplify it to get a quadratic equation.
- 3. Solve the quadratic equation obtained.

Ex. 3 Solve:
$$\sqrt{x} + 2x = 1$$

Sol. $\sqrt{x} + 2x = 1$
 $\Rightarrow \sqrt{x} = 1 - 2x$ i.e., $x = (1 - 2x)^2$
 $\Rightarrow x = 1 + 4x^2 - 4x$ i.e., $1 + 4x^2 - 4x - x = 0$
 $\Rightarrow 4x^2 - 5x + 1 = 0$ i.e., $4x^2 - 4x - x + 1 = 0$
 $\Rightarrow 4x (x - 1) - 1 (x - 1) = 0$ i.e., $(x - 1) (4x - 1) = 0$
 $\Rightarrow x - 1 = 0$
or $4x - 1 = 0$
i.e., $x = 1$ or $x = \frac{1}{4}$