NCERT Solutions For Class 10 Chapter 4 Quadratic Equations Exercise 4.3

Q1. Find the roots of the following quadratic equations if they exist by the method of completing square.

(i) $2x^2 - 7x + 3 = 0$

(ii) $2x^2 + x - 4 = 0$

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

(iv) $2x^2 + x + 4 = 0$

Ans. (i) $2x^2 - 7x + 3 = 0$

First we divide equation by 2 to make coefficient of x^2 equal to 1,

$$x^2 - \frac{7}{2}x + \frac{3}{2} = 0$$

We divide middle term of the equation by $2x$, we get

$$\frac{7}{2}x \times \frac{1}{2x} = \frac{7}{4}$$

We add and subtract square of $\frac{7}{4}$ from the equation

$$x^2 - \frac{7}{2}x + \frac{3}{2} = 0$$

,

$$x^2 - \frac{7}{2}x + \frac{3}{2} + \left(\frac{7}{4}\right)^2 - \left(\frac{7}{4}\right)^2 = 0$$

$$\Rightarrow x^2 + \left(\frac{7}{4}\right)^2 - \frac{7}{2}x + \frac{3}{2} + -\left(\frac{7}{4}\right)^2 = 0$$

$$\left\{(a-b)^2 = a^2 + b^2 - 2ab\right\}$$

$$\Rightarrow \left(x - \frac{7}{4}\right)^2 + \frac{24-49}{16} = 0$$

$$\Rightarrow \left(x - \frac{7}{4}\right)^2 = \frac{49-24}{16}$$

Taking Square root on both sides,

$$\Rightarrow x-\frac{7}{4}=\pm\frac{5}{4}$$

$$\Rightarrow x=\frac{5}{4}+\frac{7}{4}=\frac{12}{4}=3 \; and \; x=-\frac{5}{4}+\frac{7}{4}=\frac{2}{4}=\frac{1}{2}$$

Therefore, $x=\frac{1}{2},3$

(ii) $2x^2+x-4=0$

Dividing equation by 2,

$$x^2+\frac{x}{2}-2=0$$

Following procedure of completing square,

$$x^2+\frac{x}{2}-2+\left(\frac{1}{4}\right)^2-\left(\frac{1}{4}\right)^2=0$$

$$\Rightarrow x^2+\frac{x}{2}+\left(\frac{1}{4}\right)^2-2-\frac{1}{16}=0$$

$$\left\{(a+b)^2=a^2+b^2+2ab\right\}$$

$$\Rightarrow \left(x+\frac{1}{4}\right)^2-\frac{33}{16}=0$$

$$\Rightarrow \left(x+\frac{1}{4}\right)^2=\frac{33}{16}$$

Taking square root on both sides,

$$\Rightarrow x+\frac{1}{4}=\pm\frac{\sqrt{33}}{4}$$

$$\Rightarrow$$

$$x=\frac{\sqrt{33}}{4}-\frac{1}{4}=\frac{\sqrt{33}-1}{4} and \; x=-\frac{\sqrt{33}}{4}-\frac{1}{4}=\frac{-\sqrt{33}-1}{4}$$

Therefore, $x=\frac{\sqrt{33}-1}{4},\frac{-\sqrt{33}-1}{4}$

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

Dividing equation by 4,

$$x^2+\sqrt{3}x+\frac{3}{4}=0$$

Following the procedure of completing square,

$$\Rightarrow x^2+\sqrt{3}x+\frac{3}{4}+\left(\frac{\sqrt{3}}{2}\right)^2-\left(\frac{\sqrt{3}}{2}\right)^2=0$$

$$\Rightarrow x^2+\left(\frac{\sqrt{3}}{2}\right)^2+\sqrt{3}x+\frac{3}{4}-\frac{3}{4}=0$$

$$\left\{(a+b)^2=a^2+b^2+\ 2ab\right\}$$

$$\Rightarrow\left(x+\frac{\sqrt{3}}{2}\right)^2=0$$

$$\Rightarrow\left(x+\frac{\sqrt{3}}{2}\right)\left(x+\frac{\sqrt{3}}{2}\right)=0$$

Taking square root on both sides,

$$\Rightarrow x+\frac{\sqrt{3}}{2}=0, x+\frac{\sqrt{3}}{2}=0$$

$$\Rightarrow x=-\frac{\sqrt{3}}{2}, -\frac{\sqrt{3}}{2}$$

(iv) $2x^2+x+4=0$

Dividing equation by 2,

$$x^2+\frac{x}{2}+2=0$$

Following the procedure of completing square,

$$\Rightarrow x^2+\frac{x}{2}+2+\left(\frac{1}{4}\right)^2-\left(\frac{1}{4}\right)^2=0$$

$$\Rightarrow x^2+\left(\frac{1}{4}\right)^2+\frac{x}{2}+2-\left(\frac{1}{4}\right)^2=0$$

$$\left\{(a+b)^2=a^2+b^2+2ab\right\}$$

$$\Rightarrow \left(x+\frac{1}{4}\right)^2+2-\frac{1}{16}=0$$

$$\Rightarrow \left(x+\frac{1}{4}\right)^2=\frac{1}{16}-2=\frac{1-32}{16}$$

Taking square root on both sides

Right hand side does not exist because square root of negative number does not exist.

Therefore, there is no solution for quadratic equation $2x^2+x+4=0$

********** END **********