Exercise – 10A

1. Which of the following are quadratic equation in x?

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

(ii) $2x^2 + \frac{5}{2}x - \sqrt{3} = 0$

(iii) $\sqrt{2}x^2 + 7x + 5\sqrt{2}$

(iv) $\frac{1}{3}x^2 + \frac{1}{5}x - 2 = 0$

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

(vi) $x - \frac{6}{x} = 3$

(vii) $x^2 - \frac{2}{x} = x^2$

(viii) $x^2 - \frac{1}{x^2} = 5$

(ix) $(x+2)^3 = x^3 - 8$

(x) $(2x+3)(3x+2) = 6(x-1)(x-2)$

(xi) $\left(x + \frac{1}{x}\right)^2 = 2\left(x + \frac{1}{x}\right) + 3$

Sol:

(i) $(x^2 - x + 3)$ is a quadratic polynomial

$\therefore x^2 - x + 3 = 0$ is a quadratic equation.

(ii) Clearly, $\left(2x^2 + \frac{5}{2}x - \sqrt{3}\right)$ is a quadratic polynomial.

$\therefore 2x^2 + \frac{5}{2}x - \sqrt{3} = 0$ is a quadratic equation.

(iii) Clearly, $\left(\sqrt{2}x^2 + 7x + 5\sqrt{2}\right)$ is a quadratic polynomial.

$\therefore \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ is a quadratic equation.

(iv) Clearly, $\left(\frac{1}{3}x^2 + \frac{1}{5}x - 2\right)$ is a quadratic polynomial.

$\therefore \frac{1}{3}x^2 + \frac{1}{5}x - 2 = 0$ is a quadratic equation.

(v) $(x^2 - 3x - \sqrt{x} + 4)$ contains a term with $\sqrt{x}$, i.e., $x^{\frac{1}{2}}$, where $\frac{1}{2}$ is not a ineger.

Therefore, it is not a quadratic polynomial.

$\therefore x^2-3x-\sqrt{x}+4=0$ is not a quadratic equation.

(vi) $x-\frac{6}{x}=3$

$\Rightarrow x^2-6=3x$

$\Rightarrow x^2-3x-6=0$

$\left(x^3-3x-6\right)$ is not quadratic polynomial; therefore, the given equation is quadratic.

(vii) $x^2-\frac{2}{x}=x^2$

$\Rightarrow x^2+2=x^3$

$\Rightarrow x^3-x^2-2=0$

$\left(x^3-x^2-2\right)$ is not a quadratic polynomial.

$\therefore x^3-x^2-2=0$ is not a quadratic equation.

(viii) $x^2-\frac{1}{x^2}=5$

$\Rightarrow x^4-1=5x^2$

$\Rightarrow x^4-5x^2-1=0$

$\left(x^4-5x^2-1\right)$ is a polynomial with degree 4.

$\therefore x^4-5x^2-1=0$ is not a quadratic equation.

(ix) $(x+2)^3=x^3-8$

$\Rightarrow x^3+6x^2+12x+8=x^3-8$

$\Rightarrow 6x^2+12x+16=0$

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

Hence, the given equation is a quadratic equation.

(x) $(2x+3)(3x+2)=6(x-1)(x-2)$

$\Rightarrow 6x^2+4x+9x+6=6\left(x^2-3x+2\right)$

$\Rightarrow 6x^2+13x+6=6x^2-18x+12$

$\Rightarrow 31x-6=0$

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

Hence, the given equation is not a quadratic equation.

(xi) $\left(x+\frac{1}{x}\right)^2=2\left(x+\frac{1}{x}\right)+3$

$$\Rightarrow \left(\frac{x^2+1}{x}\right)^2 = 2\left(\frac{x^2+1}{x}\right)+3$$

$$\Rightarrow \left(x^2+1\right)^2 = 2x\left(x^2+1\right)+3x^2$$

$$\Rightarrow x^4+2x^2+1 = 2x^3+2x+3x^2$$

$$\Rightarrow x^4-2x^3-x^2-2x+1 = 0$$

This is not of the form $ax^2+bx+c=0$

Hence, the given equation is not a quadratic equation.

2. Which of the following are the roots of $3x^2+2x-1=0$?

(i) -1 (ii) $\frac{1}{3}$ (iii) $-\frac{1}{2}$

Sol:

The given equation is $\left(3x^2+2x-1=0\right)$.

(i) $x=(-1)$

$$\text{L.H.S.} = x^2+2x-1$$

$$= 3\times(-1)^2+2\times(-1)-1$$

$$= 3-2-1$$

$$= 0$$

$$= R.H.S.$$

Thus, (-1) is a root of $\left(3x^2+2x-1=0\right)$.

(ii) On subtracting $x=\frac{1}{3}$ in the given equation, we get:

$$\text{L.H.S.} = 3x^2+2x-1$$

$$= 3\times\left(\frac{1}{3}\right)^2+2\times\frac{1}{3}-1$$

$$= 3\times\frac{1}{9}+\frac{2}{3}-1$$

$$= \frac{1+2-3}{3}$$

$$= \frac{0}{3}$$

$$= 0$$

$$= R.H.S.$$

Thus, $\left(\frac{1}{3}\right)$ is a root of $\left(3x^2+2x-1=0\right)$

(iii) On subtracting $x=\left(-\frac{1}{2}\right)$ in the given equation, we get

$\text{L.H.S.}=3x^2+2x-1$

$=3\times\left(-\frac{1}{2}\right)^2+2\times\left(-\frac{1}{2}\right)-1$

$=3\times\frac{1}{4}-1-1$

$=\frac{3}{4}-2$

$-\frac{3-8}{4}$

$=\frac{-5}{4}\neq 0$

Thus, $L.H.S=R.H.S.$

Hence, $\left(-\frac{1}{2}\right)$ is a solution of $\left(3x^2+2x-1=0\right)$.

3. Find the value of k for which $x=1$ is a root of the equation $x^2+kx+3=0$.

Sol:

It is given that $(x=1)$ is a root of $\left(x^2+kx+3=0\right)$.

Therefore, $(x=1)$ must satisfy the equation.

$\Rightarrow(1)^2+k\times 1+3=0$

$\Rightarrow k+4=0$

$\Rightarrow k=-4$

Hence, the required value of k is -4.

4. Find the value of a and b for which $x=\frac{3}{4}$ and $x=-2$ are the roots of the equation

$ax^2+bx-6=0$

Sol:

It is given that $\frac{3}{4}$ is a root of $ax^2+bx-6=0$; therefore, we have:

$a\times\left(\frac{3}{4}\right)^2+b\times\frac{3}{4}-6=0$

$\Rightarrow \frac{9a}{16}+\frac{3b}{4}=6$

$\Rightarrow \frac{9a+12b}{16}=6$

$\Rightarrow 9a+12b-96=0$

$\Rightarrow 3a+4b=32 \quad \ldots\ldots\ldots(i)$

Again, (-2) is a root of $ax^2+bx-6=0$; therefore, we have:

$a\times(-2)^2+b\times(-2)-6=0$

$\Rightarrow 4a-2b=6$

$\Rightarrow 2a-b=3 \quad \ldots\ldots\ldots(ii)$

On multiplying (ii) by 4 and adding the result with (i), we get:

$\Rightarrow 3a+4b+8a-4b=32+12$

$\Rightarrow 11a=44$

$\Rightarrow a=4$

Putting the value of a in (ii), we get:

$2\times 4-b=3$

$\Rightarrow 8-b=3$

$\Rightarrow b=5$

Hence, the required values of a and b are 4 and 5, respectively.

5. $(2x-3)(3x+1)=0$

Sol:

$(2x-3)(3x+1)=0$

$\Rightarrow 2x-3=0 \text{ or } 3x+1=0$

$\Rightarrow 2x=3 \text{ or } 3x=-1$

$\Rightarrow x=\frac{3}{2} \text{ or } x=-\frac{1}{3}$

Hence the roots of the given equation are $\frac{3}{2}$ *and* $-\frac{1}{3}$.

6. $4x^2+5x=0$

Sol:

$4x^2+5x=0$

$\Rightarrow x(4x+5)=0$

$\Rightarrow x=0 \text{ or } 4x+5=0$

$\Rightarrow x = 0 \text{ or } x = -\frac{5}{4}$

Hence, the roots of the given equation are 0 and $-\frac{5}{4}$.

7. $3x^2 - 243 = 0.$

Sol:

Given:

$3x^2 - 243 = 0$

$\Rightarrow 3\left(x^2 - 81\right) = 0$

$\Rightarrow (x)^2 - (9)^2 = 0$

$\Rightarrow (x+9)(x-9) = 0$

$\Rightarrow x + 9 = 0 \text{ or } x - 9 = 0$

$\Rightarrow x = -9 \text{ or } x = 9$

Hence, -9 and 9 are the roots of the equation $3x^2 - 243 = 0.$

8. $2x^2 + x - 6 = 0$

Sol:

We write, $x = 4x - 3x$ as $2x^2 \times (-6) = -12x^2 = 4x \times (-3x)$

$\therefore 2x^2 + x - 6 = 0$

$\Rightarrow 2x^2 + 4x - 3x - 6 = 0$

$\Rightarrow 2x(x+2) - 3(x+2) = 0$

$\Rightarrow (x+2)(2x-3) = 0$

$\Rightarrow x + 2 = 0 \text{ or } 2x - 3 = 0$

$\Rightarrow x = -2 \text{ or } x = \frac{3}{2}$

Hence, the roots of the given equation are -2 and $\frac{3}{2}$.

9. $x^2 + 6x + 5 = 0$

Sol:

We write, $6x = x + 5x$ as $x^2 \times 5 = 5x^2 = x \times 5x$

$\therefore x^2 + 6x + 5 = 0$

$\Rightarrow x^2 + x - 5x + 5 = 0$

$\Rightarrow x(x+1)+5(x+1)=0$

$\Rightarrow (x+1)(x+5)=0$

$\Rightarrow x+1=0 \text{ or } x+5=0$

$\Rightarrow x=-1 \text{ or } x=-5$

Hence, the roots of the given equation are -1 and -5.

10. $9x^2-3x-2=0$

Sol:

We write, $-3x=3x-6x$ as $9x^2\times(-2)=-18x^2=3x\times(-6x)$

$\therefore 9x^2-3x-2=0$

$\Rightarrow 9x^2+3x-6x-2=0$

$\Rightarrow 3x(3x+1)-2(3x+1)=0$

$\Rightarrow (3x+1)(3x-2)=0$

$\Rightarrow 3x+1=0 \text{ or } 3x-2=0$

$\Rightarrow x=-\frac{1}{3} \text{ or } x=\frac{2}{3}$

Hence, the roots of the given equation are $-\frac{1}{3}$ and $\frac{2}{3}$.

11. $x^2+12x+35=0$

Sol:

Given:

$x^2+12x+35=0$

$\Rightarrow x^2+7x+5x+35=0$

$\Rightarrow x(x+7)+5(x+7)=0$

$\Rightarrow (x+5)(x+7)=0$

$\Rightarrow x+5=0 \text{ or } x+7=0$

$\Rightarrow x=-5 \text{ or } x=-7$

Hence, -5 and -7 are the roots of the equation $x^2+12x+35=0$.

12. $x^2=18x-77$

Sol:

Given

$x^2=18x-77$

$\Rightarrow x^2-18x+77=0$

$\Rightarrow x^2-(11x+7x)+77=0$

$\Rightarrow x^2-11x-7x+77=0$

$\Rightarrow x(x-11)-7(x-11)=0$

$\Rightarrow (x-7)(x-11)=0$

$\Rightarrow x-7=0 \text{ or } x-11=0$

$\Rightarrow x=7 \text{ or } x=11$

Hence, 7 and 11 are the roots of the equation $x^2=18x-77$.

13. $6x^2+11x+3=0.$

Sol:

Given:

$6x^2+11x+3=0$

$\Rightarrow 6x^2+9x+2x+3=0$

$\Rightarrow 3x(2x+3)+1(2x+3)=0$

$\Rightarrow (3x+1)(2x+3)=0$

$\Rightarrow 3x+1=0 \text{ or } 2x+3=0$

$\Rightarrow x=\frac{-1}{3} \text{ or } x=\frac{-3}{2}$

Hence, $\frac{-1}{3}$ and $\frac{-3}{2}$ are the roots of the equation $6x^2+11x+3=0.$

14. $6x^2+x-12=0.$

Sol:

Given:

$6x^2+x-12=0$

$\Rightarrow 6x^2+9x-8x-12=0$

$\Rightarrow 3x(2x+3)-4(2x+3)=0$

$\Rightarrow (3x-4)(2x+3)=0$

$\Rightarrow 3x-4=0 \text{ or } 2x+3=0$

$\Rightarrow x=\frac{4}{3} \text{ or } x=\frac{-3}{2}$

Hence, $\frac{4}{3}$ and $\frac{-3}{2}$ are the roots of the equation $6x^2+x-12=0.$

15. $3x^2-2x-1=0$

Sol:

We write, $-2x=-3x+x$ as $3x^2\times(-1)=-3x^2=(-3x)\times x$

$\therefore 3x^2-2x-1=0$

$\Rightarrow 3x^2-3x+x-1=0$

$\Rightarrow 3x(x-1)+1(x-1)=0$

$\Rightarrow (x-1)(3x+1)=0$

$\Rightarrow x-1=0 \text{ or } 3x+1=0$

$\Rightarrow x=1 \text{ or } x=-\frac{1}{3}$

Hence, the roots of the given equation are 1 and $-\frac{1}{3}$.

16. $4x^2-9x=100$

Sol:

Given:

$4x^2-9x=100$

$\Rightarrow 4x^2-9x-100=0$

$\Rightarrow 4x^2-(25x-16x)-100=0$

$\Rightarrow 4x^2-25x+16x-100=0$

$\Rightarrow x(4x-25)+4(4x-25)=0$

$\Rightarrow (4x-25)(x+4)=0$

$\Rightarrow 4x-25=0 \text{ or } x+4=0$

$\Rightarrow x=\frac{25}{4} \text{ or } x=-4$

Hence, the roots of the equation are $\frac{25}{4}$ *and* -4.

17. $15x^2-28=x$

Sol:

Given:

$15x^2-28=x$

$\Rightarrow 15x^2-x-28=0$

$\Rightarrow 15x^2-(21x-20x)-28=0$

$\Rightarrow 15x^2-21x+20x-28=0$

$\Rightarrow 3x(5x-7)+4(5x-7)=0$

$\Rightarrow (3x+4)(5x-7)=0$

$\Rightarrow 3x+4=0 \text{ or } 5x-7=0$

$\Rightarrow x=\frac{-4}{3} \text{ or } x=\frac{7}{5}$

Hence, the roots of the equation are $\frac{-4}{3}$ and $\frac{7}{5}$.

18. $4-11x=3x^2$

Sol:

Given:

$4-11x=3x^2$

$\Rightarrow 3x^2+11x-4=0$

$\Rightarrow 3x^2+12x-x-4=0$

$\Rightarrow 3x(x+4)-1(x+4)=0$

$\Rightarrow (x+4)(3x-1)=0$

$\Rightarrow x+4=0 \text{ or } 3x-1=0$

$\Rightarrow x=-4 \text{ or } x=\frac{1}{3}$

Hence, the roots of the equation are -4 and $\frac{1}{3}$.

19. $48x^2-13x-1=0$

Sol:

Given:

$48x^2-13x-1=0$

$\Rightarrow 48x^2-(16x-3x)-1=0$

$\Rightarrow 48x^2-16x+3x-1=0$

$\Rightarrow 16x(3x-1)+1(3x-1)=0$

$\Rightarrow (16x+1)(3x-1)=0$

$\Rightarrow 16x+1=0 \text{ or } 3x-1=0$

$\Rightarrow x=\frac{-1}{16} \text{ or } x=\frac{1}{3}$

Hence, the roots of the equation are $\frac{-1}{16}$ and $\frac{1}{3}$.

20. $x^2+2\sqrt{2}x-6=0$

Sol:

We write:

$2\sqrt{2}x=3\sqrt{2}x-\sqrt{2}x$ as $x^2\times(-6)=-6x^2=3\sqrt{2}x\times\left(-\sqrt{2}x\right)$

$\therefore x^2+2\sqrt{2}x-6=0$

$\Rightarrow x^2+2\sqrt{2}x-\sqrt{2}x-6=0$

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

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

$\Rightarrow x+3\sqrt{2}=0$ *or* $x-\sqrt{2}=0$

$\Rightarrow x=-3\sqrt{2}$ or $x=\sqrt{2}$

Hence, the roots of the given equation are $-3\sqrt{2}$ and $\sqrt{2}$

21. $\sqrt{3}x^2+10x+7\sqrt{3}=0$

Sol:

We write: $10x=3x+7x$ as $\sqrt{3}x^2\times7\sqrt{3}=21x^2=3x\times7x$

$\therefore \sqrt{3}x^2+10x+7\sqrt{3}=0$

$\Rightarrow \sqrt{3}x^2+3x+7x+7\sqrt{3}=0$

$\Rightarrow \sqrt{3}x\left(x+\sqrt{3}\right)+7\left(x+\sqrt{3}\right)=0$

$\Rightarrow \left(x+\sqrt{3}\right)\left(\sqrt{3}x+7\right)=0$

$\Rightarrow x+\sqrt{3}=0$ *or* $\sqrt{3}x+7=0$

$\Rightarrow x=-\sqrt{3}$ or $x=-\dfrac{7}{\sqrt{3}}=-\dfrac{7\sqrt{3}}{3}$

Hence, the roots of the given equation are $-\sqrt{3}$ and $-\dfrac{7\sqrt{3}}{3}$.

22. $\sqrt{3}x^2+11x+6\sqrt{3}=0$

Sol:

Given:

$\sqrt{3}x^2+11x+6\sqrt{3}=0$

$\Rightarrow \sqrt{3}x^2+9x+2x+6\sqrt{3}=0$

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

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

$\Rightarrow x+3\sqrt{3}=0 \text{ or } \sqrt{3}x+2=0$

$\Rightarrow x=-3\sqrt{3} \text{ or } x=\frac{-2}{\sqrt{3}}=\frac{-2\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}}=\frac{-2\sqrt{3}}{3}$

Hence, the roots of the equation are $-3\sqrt{3}$ and $\frac{-2\sqrt{3}}{3}$.

23. $3\sqrt{7}x^2+4x-\sqrt{7}=0$

Sol:

Given:

$3\sqrt{7}x^2+4x-\sqrt{7}=0$

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

$\Rightarrow \sqrt{7}x\left(3x+\sqrt{7}\right)-1\left(3x+\sqrt{7}\right)=0$

$\Rightarrow \left(3x+\sqrt{7}\right)\left(\sqrt{7}-1\right)=0$

$\Rightarrow 3x+\sqrt{7}=0 \text{ or } \sqrt{7}x-1=0$

$\Rightarrow x=\frac{-\sqrt{7}}{3} \text{ or } x=\frac{1}{\sqrt{7}}=\frac{1\times\sqrt{7}}{\sqrt{7}\times\sqrt{7}}=\frac{\sqrt{7}}{7}$

Hence, the roots of the equation are $\frac{-\sqrt{7}}{3}$ and $\frac{\sqrt{7}}{7}$.

24. $\sqrt{7}x^2-6x-13\sqrt{7}=0$

Sol:

We write, $-6x=7x-13x$ as $\sqrt{7}x^2\times\left(-13\sqrt{7}\right)=-91x^2=7x\times(-13x)$

$\therefore \sqrt{7}x^2-6x-13\sqrt{7}=0$

$\Rightarrow \sqrt{7}x^2+7x-13x-13\sqrt{7}=0$

$\Rightarrow \sqrt{7}x\left(x+\sqrt{7}\right)-13\left(x+\sqrt{7}\right)=0$

$\Rightarrow \left(x+\sqrt{7}\right)\left(\sqrt{7}x-13\right)=0$

$\Rightarrow x+\sqrt{7}=0 \text{ or } \sqrt{7}x-13=0$

$\Rightarrow x=-\sqrt{7} \text{ or } x=\frac{13}{\sqrt{7}}=\frac{13\sqrt{7}}{7}$

Hence, the roots of the given equation are $-\sqrt{7}$ and $\frac{13\sqrt{7}}{7}$.

25. $4\sqrt{6}x^2 - 13x - 2\sqrt{6} = 0$

Sol:

Given:

$4\sqrt{6}x^2 - 13x - 2\sqrt{6} = 0$

$\Rightarrow 4\sqrt{6}x^2 - 16x + 3x - 2\sqrt{6} = 0$

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

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

$\Rightarrow 4\sqrt{2}x + \sqrt{3} = 0 \text{ or } \sqrt{3}x - 2\sqrt{2} = 0$

$\Rightarrow x = \frac{-\sqrt{3}}{4\sqrt{2}} = \frac{-\sqrt{3}\times\sqrt{2}}{4\sqrt{2}\times\sqrt{2}} = \frac{-\sqrt{8}}{8}$ or $x = \frac{2\sqrt{2}}{\sqrt{3}} = \frac{2\sqrt{2}\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}} = \frac{2\sqrt{6}}{3}$

Hence, the roots of the equation are $\frac{-\sqrt{6}}{8}$ and $\frac{2\sqrt{6}}{3}$.

26. $3x^2 - 2\sqrt{6}x + 2 = 0$

Sol:

We write, $-2\sqrt{6}x = -\sqrt{6}x$ ad $3x^2 \times 2 = 6x^2 = \left(-\sqrt{6}x\right)\times\left(-\sqrt{6}x\right)$

$\therefore 3x^2 - 2\sqrt{6}x + 2 = 0$

$\Rightarrow 3x^2 - \sqrt{6}x - \sqrt{6}x + 2 = 0$

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

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

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

$\Rightarrow \sqrt{3}x - \sqrt{2} = 0$

$\Rightarrow x = \frac{\sqrt{2}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$

Hence, $\frac{\sqrt{6}}{3}$ is the repeated root of the given equation.

27. $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$

Sol:

We write, $-2\sqrt{2}x = -3\sqrt{2}x + \sqrt{2}x$ as $\sqrt{3}x^2 \times \left(-2\sqrt{3}\right) = -6x^2 = \left(-3\sqrt{2}x\right)\times\left(\sqrt{2}x\right)$

$\therefore \sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$

$\Rightarrow \sqrt{3}x^2 - 3\sqrt{2}x + \sqrt{2}x - 2\sqrt{3} = 0$

$\Rightarrow \sqrt{3}x\left(x - \sqrt{6}\right) + \sqrt{2}\left(x - \sqrt{6}\right) = 0$

$\Rightarrow \left(x - \sqrt{6}\right)\left(\sqrt{3}x + \sqrt{2}\right) = 0$

$\Rightarrow x - \sqrt{6} = 0 \text{ or } \sqrt{3}x + \sqrt{2} = 0$

$\Rightarrow x - \sqrt{6} = 0 \text{ or } x = -\frac{\sqrt{2}}{\sqrt{3}} = -\frac{\sqrt{6}}{3}$

Hence, the roots of the given equation are $\sqrt{6}$ and $-\frac{\sqrt{6}}{3}$.

28. $x^2 - 3\sqrt{5}x + 10 = 0$

Sol:

We write, $-3\sqrt{5}x = -2\sqrt{5}x - \sqrt{5}x$ as $x^2 \times 10 = 10x^2 = \left(-2\sqrt{5}x\right) \times \left(-\sqrt{5}x\right)$

$\therefore x^2 - 3\sqrt{5}x + 10 = 0$

$\Rightarrow x^2 - 2\sqrt{5}x - \sqrt{5}x + 10 = 0$

$\Rightarrow x\left(x - 2\sqrt{5}\right) - \sqrt{5}\left(x - 2\sqrt{5}\right) = 0$

$\Rightarrow \left(x - 2\sqrt{5}\right)\left(x - \sqrt{5}\right) = 0$

$\Rightarrow x\left(x - 2\sqrt{5}\right) - \sqrt{5}\left(x - 2\sqrt{5}\right) = 0$

Hence, the roots of the given equation are $\sqrt{5}$ and $2\sqrt{5}$.

29. $x^2 - \left(\sqrt{3} + 1\right)x + \sqrt{3} = 0$

Sol:

$x^2 - \left(\sqrt{3} + 1\right)x + \sqrt{3} = 0$

$\Rightarrow x^2 - \sqrt{3}x - x + \sqrt{3} = 0$

$\Rightarrow x\left(x - \sqrt{3}\right) - 1\left(x - \sqrt{3}\right) = 0$

$\Rightarrow \left(x - \sqrt{3}\right)(x - 1) = 0$

$\Rightarrow x - \sqrt{3} = 0 \text{ or } x - 1 = 0$

$\Rightarrow x = \sqrt{3} \text{ or } x = 1$

Hence, 1 and $\sqrt{3}$ are the roots of the given equation.

30. $x^2+3\sqrt{3}x-30=0$

Sol:

We write, $3\sqrt{3}x=5\sqrt{3}x-2\sqrt{3}x$ as $x^2\times(-30)=-30x^2=5\sqrt{3}x\times\left(-2\sqrt{3}x\right)$

$\therefore x^2+3\sqrt{3}x-30=0$

$\Rightarrow x^2+5\sqrt{3}x-2\sqrt{3}x-30=0$

$\Rightarrow x\left(x+5\sqrt{3}\right)-2\sqrt{3}\left(x+5\sqrt{3}\right)=0$

$\Rightarrow \left(x+5\sqrt{3}\right)\left(x-2\sqrt{3}\right)=0$

$\Rightarrow x+5\sqrt{3}=0$ *or* $x-2\sqrt{3}=0$

$\Rightarrow x=-5\sqrt{3}$ *or* $x=2\sqrt{3}$

Hence, the roots of the given equation are $-5\sqrt{3}$ and $2\sqrt{3}$

31. $\sqrt{2}x^2+7x+5\sqrt{2}=0$

Sol:

We write, $7x=5x+2x$ as $\sqrt{2}x^2\times5\sqrt{2}=10x^2=5x\times2x$

$\therefore \sqrt{2}x^2+7x+5\sqrt{2}=0$

$\Rightarrow \sqrt{2}x^2+5x+2x+5\sqrt{2}=0$

$\Rightarrow x\left(\sqrt{2}x+5\right)+\sqrt{2}\left(\sqrt{2}x+5\right)=0$

$\Rightarrow \left(\sqrt{2}x+5\right)\left(x+\sqrt{2}\right)=0$

$\Rightarrow x+\sqrt{2}=0$ *or* $\sqrt{2}x+5=0$

$\Rightarrow x=-\sqrt{2}$ *or* $x=-\dfrac{5}{\sqrt{2}}=-\dfrac{5\sqrt{2}}{2}$

Hence, the roots of the given equation are $-\sqrt{2}$ and $-\dfrac{5\sqrt{2}}{2}$.

32. $5x^2+13x+8=0$

Sol:

We write, $13x=5x+8x$ as $5x^2\times8=40x^2=5x\times8x$

$\therefore 5x^2+13x+8=0$

$\Rightarrow 5x^2+5x+8x+8=0$

$\Rightarrow 5x(x+1)+8(x+1)=0$

$\Rightarrow (x+1)(5x+8)=0$

$\Rightarrow x+1=0$ *or* $5x+8=0$

$x=-1$ *or* $x=-\frac{8}{5}$

Hence, -1 and $-\frac{8}{5}$ are the roots of the given equation.

33. $x^2-\left(1+\sqrt{2}\right)x+\sqrt{2}=0$

Sol:

Given:

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

$\Rightarrow x^2-x-\sqrt{2}x+\sqrt{2}=0$

$\Rightarrow x(x-1)-\sqrt{2}(x-1)=0$

$\Rightarrow \left(x-\sqrt{2}\right)(x-1)=0$

$\Rightarrow x-\sqrt{2}=0$ *or* $x-1=0$

$\Rightarrow x=\sqrt{2}$ *or* $x=1$

Hence, the roots of the equation are $\sqrt{2}$ and 1.

34. $9x^2+6x+1=0$

Sol:

Given:

$9x^2+6x+1=0$

$\Rightarrow 9x^2+3x+3x+1=0$

$\Rightarrow 3x(3x+1)+1(3x+1)=0$

$\Rightarrow (3x+1)(3x+1)=0$

$\Rightarrow 3x+1=0$ *or* $3x+1=0$

$\Rightarrow x=\frac{-1}{3}$ *or* $x=\frac{-1}{3}$

Hence, $\frac{-1}{3}$ is the root of the equation $9x^2+6x+1=0$.

35. $100x^2-20x+1=0$

Sol:

We write, $-20x=-10x-10x$ as $100x^2\times 1=100x^2=(-10x)\times(-10x)$

$\therefore 100x^2-20x+1=0$

$\Rightarrow 100x^2-10x-10x+1=0$

$\Rightarrow 10x(10x-1)-1(10x-1)=0$

$\Rightarrow (10x-1)(10x-1)=0$

$\Rightarrow (10x-1)^2=0$

$\Rightarrow 10x-1=0$

$\Rightarrow x=\frac{1}{10}$

Hence, $\frac{1}{10}$ is the repeated root of the given equation.

36. $2x^2-x+\frac{1}{8}=0$

Sol:

We write, $-x=-\frac{x}{2}-\frac{x}{2}$ as $2x^2\times\frac{1}{8}=\frac{x^2}{4}=\left(-\frac{x}{2}\right)\times\left(-\frac{x}{2}\right)$

$\therefore 2x^2-x+\frac{1}{8}=0$

$\Rightarrow 2x^2-\frac{x}{2}-\frac{x}{2}+\frac{1}{8}=0$

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

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

$\Rightarrow x-\frac{1}{4}=0 \text{ or } 2x-\frac{1}{2}=0$

$\Rightarrow x=\frac{1}{4} \text{ or } x=\frac{1}{4}$

Hence, $\frac{1}{4}$ is the repeated root of the given equation.

37. $10x-\frac{1}{x}=3$

Sol:

Given:

$10x-\frac{1}{x}=3$

$\Rightarrow 10x^2-1=3x$ [Multiplying both sides by x]

$\Rightarrow 10x^2-3x-1=0$

$\Rightarrow 10x^2-(5x-2x)-1=0$

$\Rightarrow 10x^2-5x+2x-1=0$

$\Rightarrow 5x(2x-1)+1(2x-1)=0$

$\Rightarrow (2x-1)(5x+1)=0$

$\Rightarrow 2x-1=0$ or $5x+1=0$

$\Rightarrow x=\frac{1}{2}$ or $x=\frac{-1}{5}$

Hence, the roots of the equation are $\frac{1}{2}$ and $\frac{-1}{5}$.

38. $\frac{2}{x^2}-\frac{5}{x}+2=0$

Sol:

Given:

$\frac{2}{x^2}-\frac{5}{x}+2=0$

$\Rightarrow 2-5x+2x^2=0$ [Multiplying both sides by x^2]

$\Rightarrow 2x^2-5x+2=0$

$\Rightarrow 2x^2-(4x+x)+2=0$

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

$\Rightarrow 2x(x-2)-1(x-2)=0$

$\Rightarrow (2x-1)(x-2)=0$

$\Rightarrow 2x-1=0$ *or* $x-2=0$

$\Rightarrow x=\frac{1}{2}$ *or* $x=2$

Hence, the roots of the equation are $\frac{1}{2}$ and 2.

39. $2x^2+ax-a^2=0$

Sol:

We write, $ax=2ax-ax$ as $2x^2\times(-a^2)=-2a^2x^2=2ax\times(-ax)$

$\therefore 2x^2+ax-a^2=0$

$\Rightarrow 2x^2+2ax-ax-a^2=0$

$\Rightarrow 2x(x+a)-a(x+a)=0$

$\Rightarrow (x+a)(2x-a)=0$

$\Rightarrow x+a=0 \text{ or } 2x-a=0$

$\Rightarrow x=-a \text{ or } x=\frac{a}{2}$

Hence, $-a$ and $\frac{a}{2}$ are the roots of the given equation.

40. $4x^2+4bx-\left(a^2-b^2\right)=0$

Sol:

We write, $4bx=2(a+b)x-2(a-b)x$ as

$4x^2\times\left[-\left(a^2-b^2\right)\right]=-4\left(a^2-b^2\right)x^2=2(a+b)x\times\left[-2(a-b)x\right]$

$\therefore 4x^2+4bx-\left(a^2-b^2\right)=0$

$\Rightarrow 4x^2+2(a+b)x-2(a-b)x-(a-b)(a+b)=0$

$\Rightarrow 2x\left[2x+(a+b)\right]-(a-b)\left[2x+(a+b)\right]=0$

$\Rightarrow\left[2x+(a+b)\right]\left[2x-(a-b)\right]=0$

$\Rightarrow 2x+(a+b)=0 \text{ or } 2x-(a-b)=0$

$\Rightarrow x=-\frac{a+b}{2} \text{ or } x=\frac{a-b}{2}$

Hence, $-\frac{a+b}{2}$ and $\frac{a-b}{2}$ are the roots of the given equation.

41. $4x^2-4a^2x+\left(a^4-b^4\right)=0$

Sol:

We write, $-4a^2x=-2\left(a^2+b^2\right)x-2\left(a^2-b^2\right)x$ as

$4x^2\times\left(a^4-b^4\right)=4\left(a^4-b^4\right)x^2=\left[-2\left(a^2+b^2\right)\right]x\times\left[-2\left(a^2-b^2\right)\right]x$

$\therefore 4x^2-4a^2x+\left(a^4-b^4\right)=0$

$\Rightarrow 4x^2-2\left(a^2+b^2\right)x-2\left(a^2-b^2\right)x+\left(a^2-b^2\right)\left(a^2+b^2\right)=0$

$\Rightarrow 2x\left[2x-\left(a^2+b^2\right)\right]-\left(a^2-b^2\right)\left[2x-\left(a^2+b^2\right)\right]=0$

$\Rightarrow\left[2x-\left(a^2+b^2\right)\right]\left[2x-\left(a^2-b^2\right)\right]=0$

$\Rightarrow 2x-\left(a^2+b^2\right)=0 \text{ or } 2x-\left(a^2-b^2\right)=0$

$\Rightarrow x=\frac{a^2+b^2}{2} \text{ or } x=\frac{a^2-b^2}{2}$

Hence, $\frac{a^2+b^2}{2}$ and $\frac{a^2-b^2}{2}$ are the roots of the given equation.

42. $x^2+5x-\left(a^2+a-6\right)=0$

Sol:

We write, $5x=(a+3)x-(a-2)x$ as

$x^2\times\left[-\left(a^2+a-6\right)\right]=-\left(a^2+a-6\right)x^2=(a+3)x\times\left[-(a-2)x\right]$

$\therefore x^2+5x-\left(a^2+a-6\right)=0$

$\Rightarrow x^2+(a+3)x-(a-2)x-(a+3)(a-2)=0$

$\Rightarrow x\left[x+(a+3)\right]-(a-2)\left[x+(a+3)\right]=0$

$\Rightarrow\left[x+(a+3)\right]\left[x-(a-2)\right]=0$

$\Rightarrow x+(a+3)=0\ x-(a-2)=0$

$\Rightarrow x=-(a+3)\ or\ x=a-2$

Hence, $-(a+3)$ and $(a-2)$ are the roots of the given equation.

43. $x^2-2ax-\left(4b^2-a^2\right)=0$

Sol:

We have, $-2ax=(2b-a)x-(2b+a)x$ as

$x^2\times\left[-\left(4b^2-a^2\right)\right]=-\left(4b^2-a^2\right)x^2=(2b-a)x\times\left[-(2b+a)x\right]$

$\therefore x^2-2ax-\left(4b^2-a^2\right)=0$

$\Rightarrow x^2+(2b-a)x-(2b+a)x-(2b-a)(2b+a)=0$

$\Rightarrow x\left[x+(2b-a)\right]-(2b+a)\left[x+(2b-a)\right]=0$

$\Rightarrow\left[x+(2b-a)\right]\left[x-(2b+a)\right]=0$

$\Rightarrow x+(2b-a)=0\ or\ x-(2b+a)=0$

$x=-(2b-a)$ or $x=2b+a$

$\Rightarrow x=a-2b\ or\ x=a+2b$

Hence, $a-2b$ and $a+2b$ are the roots of the given equation.

44. $x^2-(2b-1)x+\left(b^2-b-20\right)=0$

Sol:

We write, $-(2b-1)x=-(b-5)x-(b+4)x$ as

$x^2 \times (b^2 - b - 20) = (b^2 - b - 20)x^2 = [-(b-5)x] \times [-(b+4)x]$

$\therefore x^2 - (2b-1)x + (b^2 - b - 20) = 0$

$\Rightarrow x^2 - (b-5)x - (b+4)x + (b-5)(b+4) = 0$

$\Rightarrow x[x-(b-5)] - (b+4)[x-(b-5)] = 0$

$\Rightarrow [x-b-5][x-(b+4)] = 0$

$\Rightarrow x-(b-5) = 0$ or $x-(b+4) = 0$

$\Rightarrow x = b-5$ or $x = b+4$

Hence, $b-5$ and $b+4$ are the roots of the given equation.

45. $x^2 + 6x - (a^2 + 2a - 8) = 0$

Sol:

We write, $6x = (a+4)x - (a-2)x$ as

$x^2 \times [-(a^2 + 2a - 8)] = -(a^2 + 2a - 8)x^2 = (a+4)x \times [-(a-2)x]$

$\therefore x^2 + 6x - (a^2 + 2a - 8) = 0$

$\Rightarrow x^2 + (a+4)x - (a-2)x - (a+4)(a-2) = 0$

$\Rightarrow x[x+(a+4)] - (a-2)[x+(a+4)] = 0$

$\Rightarrow [x+(a+4)][x-(a-2)] = 0$

$\Rightarrow x+(a+4) = 0$ *or* $x-(a-2) = 0$

$\Rightarrow x = -(a+4)$ or $x = a-2$

Hence, $-(a+4)$ and $(a-2)$ are the roots of the given equation.

46. $abx^2 + (b^2 - ac)x - bc = 0$

Sol:

$abx^2 + (b^2 - ac)x - bc = 0$

$\Rightarrow abx^2 + b^2x - acx - bc = 0$

$\Rightarrow bx(ax+b) - c(ax+b) = 0$

$\Rightarrow (bx-c)(ax+b) = 0$

$\Rightarrow bx - c = 0$ or $ax + b = 0$

$\Rightarrow x = \frac{c}{b}$ *or* $x = \frac{-b}{a}$

Hence, the roots of the equation are $\frac{c}{b}$ and $\frac{-b}{a}$.

47. $x^2-4ax-b^2+4a^2=0$

Sol:

We write, $-4ax=-(b+2a)x+(b-2a)x$ as

$x^2\times(-b^2+4a^2)=(-b^2+4a^2)x^2=-(b+2a)x\times(b-2a)x$

$\therefore x^2-4ax-b^2+4a^2=0$

$\Rightarrow x^2-(b+2a)x(b-2a)x-(b-2a)(b+2a)=0$

$\Rightarrow x[x-(b+2a)]+(b-2a)[x-(b+2a)]=0$

$\Rightarrow [x-(b+2a)][x+(b-2a)]=0$

$\Rightarrow x-(b+2a)=0 \text{ or } x+(b-2a)=0$

$\Rightarrow x=2a+b \text{ or } x=-(b-2a)$

$\Rightarrow x=2a+b \text{ or } x=2a-b$

Hence, $(2a+b)$ and $(2a-b)$ are the roots of the given equation.

48. $4x^2-2(a^2+b^2)x+a^2b^2=0$

Sol:

Given:

$4x^2-2(a^2+b^2)x+a^2b^2=0$

$\Rightarrow 4x^2-2a^2x-2b^2x+a^2b^2=0$

$\Rightarrow 2x(2x-a^2)-b^2(2x-a^2)=0$

$\Rightarrow (2x-b^2)(2x-a^2)=0$

$\Rightarrow 2x-b^2=0 \text{ or } 2x-a^2=0$

$\Rightarrow x=\frac{b^2}{2} \text{ or } x=\frac{a^2}{2}$

Hence, the roots of the equation are $\frac{b^2}{2}$ and $\frac{a^2}{2}$.

49. $12abx^2-(9a^2-8b^2)x-6ab=0$

Sol:

Given:

$12abx^2-\left(9a^2-8b^2\right)x-6ab=0$

$\Rightarrow 12abx^2-9a^2x+8b^2x-6ab=0$

$\Rightarrow 3ax\left(4bx-3a\right)+2b\left(4bx-3a\right)=0$

$\Rightarrow \left(3ax+2b\right)\left(4bx-3a\right)=0$

$\Rightarrow 3ax+2b=0 \text{ or } 4bx-3a=0$

$\Rightarrow x=\frac{-2b}{3a} \text{ or } x=\frac{3a}{4b}$

Hence, the roots of the equation are $\frac{-2b}{3a}$ and $\frac{3a}{4b}$.

50. $a^2b^2x^2+b^2x-a^2x-1=0$

Sol:

Given:

$a^2b^2x^2+b^2x-a^2x-1=0$

$\Rightarrow b^2x\left(a^2x+1\right)-1\left(a^2x+1\right)=0$

$\Rightarrow \left(b^2x-1\right)\left(a^2x+1\right)=0$

$\Rightarrow \left(b^2x-1\right)=0 \text{ or } \left(a^2x+1\right)=0$

$\Rightarrow x=\frac{1}{b^2} \text{ or } x=\frac{-1}{a^2}$

Hence, $\frac{1}{b^2}$ and $\frac{-1}{a^2}$ are the roots of the given equation.

51. $9x^2-9\left(a+b\right)x+\left(2a^2+5ab+2b^2\right)=0$

Sol:

We write, $-9\left(a+b\right)x=-3\left(2a+b\right)x-3\left(a+2b\right)x$ as

$9x^2\times\left(2a^2+5ab+2b^2\right)=9\left(2a^2+5ab+2b^2\right)x^2=\left[-3\left(2a+b\right)x\right]\times\left[-3\left(a+2b\right)x\right]$

$\therefore 9x^2-9\left(a+b\right)x+\left(2a^2+5ab+2b^2\right)=0$

$\Rightarrow 9x^2-3\left(2a+b\right)x-3\left(a+2b\right)x+\left(2a+b\right)\left(a+2b\right)=0$

$\Rightarrow 3x\left[3x-\left(2a+b\right)\right]-\left(a+2b\right)\left[3x-\left(2a+b\right)\right]=0$

$\Rightarrow \left[3x-\left(2a+b\right)\right]\left[3x-\left(a+2b\right)\right]=0$

$\Rightarrow 3x-\left(2a+b\right)=0 \text{ or } 3x-\left(a+2b\right)=0$

$\Rightarrow x = \frac{2a+b}{3}$ *or* $x = \frac{a+2b}{3}$

Hence, $\frac{2a+b}{3}$ and $\frac{a+2b}{3}$ are the roots of the given equation.

52. $\frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$

Sol:

$\frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$

$\Rightarrow \frac{16}{x} - \frac{15}{x+1} = 1$

$\Rightarrow \frac{16x+16-15x}{x(x+1)} = 1$

$\Rightarrow \frac{x+16}{x^2+x} = 1$

$\Rightarrow x^2 + x = x + 16$ (Cross multiplication)

$\Rightarrow x^2 - 16 = 0$

$\Rightarrow (x+4)(x-4) = 0$

$\Rightarrow x + 4 = 0$ *or* $x - 4 = 0$

$\Rightarrow x = -4$ *or* $x = 4$

Hence, -4 and 4 are the roots of the given equation.

53. $\frac{4}{x} - 3 = \frac{5}{2x+3}, x \neq 0, -\frac{3}{2}$

Sol:

$\frac{4}{x} - 3 = \frac{5}{2x+3}, x \neq 0, -\frac{3}{2}$

$\Rightarrow \frac{4}{x} - \frac{5}{2x+3} = 3$

$\Rightarrow \frac{8x+12-5x}{x(2x+3)} = 3$

$\Rightarrow \frac{3x+12}{2x^2+3x} = 3$

$\Rightarrow \frac{x+4}{2x^2+3x} = 1$

$\Rightarrow 2x^2+3x=x+4$ (Cross multiplication)

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

$\Rightarrow x^2+x-2=0$

$\Rightarrow x^2+2x-x-2=0$

$\Rightarrow x(x+2)-1(x+2)=0$

$\Rightarrow (x+2)(x-1)=0$

$\Rightarrow x+2=0$ or $x-1=0$

$\Rightarrow x=-2$ or $x=1$

Hence, -2 and 1 are the roots of the given equation.

54. $\frac{3}{x+1}-\frac{1}{2}=\frac{2}{3x-1}, x\neq -1,\frac{1}{3}$

Sol:

$\frac{3}{x+1}-\frac{1}{2}=\frac{2}{3x-1}, x\neq -1,\frac{1}{3}$

$\Rightarrow \frac{3}{x+1}-\frac{2}{3x-1}=\frac{1}{2}$

$\Rightarrow \frac{9x-3-2x-2}{(x+1)(3x-1)}=\frac{1}{2}$

$\Rightarrow \frac{7x-5}{3x^2+2x-1}=\frac{1}{2}$

$\Rightarrow 3x^2+2x-1=14x-10$ (Cross multiplication)

$\Rightarrow 3x^2-12x+9=0$

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

$\Rightarrow x^2-3x-x+3=0$

$\Rightarrow x(x-3)-1(x-3)=0$

$\Rightarrow (x-3)(x-1)=0$

$\Rightarrow x-3=0$ *or* $x-1=0$

$\Rightarrow x=3$ *or* $x=1$

Hence, 1 and 3 are the roots of the given equation.

55. $\frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}, x\neq 1,-5$

Sol:

$\frac{1}{x-1}-\frac{1}{x+5}=\frac{6}{7}, x\neq 1,-5$

$\Rightarrow \frac{x+5-x+1}{(x-1)(x+5)}=\frac{6}{7}$

$\Rightarrow \frac{6}{x^2+4x-5}=\frac{6}{7}$

$\Rightarrow x^2+4x-5=7$

$\Rightarrow x^2+4x-12=0$

$\Rightarrow x^2+6x-2x-12=0$

$\Rightarrow x(x+6)-2(x+6)=0$

$\Rightarrow (x+6)(x-2)=0$

$\Rightarrow x+6=0 \text{ or } x-2=0$

$\Rightarrow x=-6 \text{ or } x=2$

Hence, -6 and 2 are the roots of the given equation.

56. $\frac{1}{2a+b+2x}=\frac{1}{2a}+\frac{1}{b}+\frac{1}{2x}$

Sol:

$\frac{1}{2a+b+2x}=\frac{1}{2a}+\frac{1}{b}+\frac{1}{2x}$

$\Rightarrow \frac{1}{2a+b+2x}-\frac{1}{2x}=\frac{1}{2a}+\frac{1}{b}$

$\Rightarrow \frac{2x-2a-b-2x}{2x(2a+b+2x)}=\frac{2a+b}{2ab}$

$\Rightarrow \frac{-(2a+b)}{4x^2+4ax+2bx}=\frac{2a+b}{2ab}$

$\Rightarrow 4x^2+4ax+2bx=-2ab$

$\Rightarrow 4x^2+4ax+2bx+2ab=0$

$\Rightarrow 4x(x+a)+2b(x+a)=0$

$\Rightarrow (x+a)(4x+2b)=0$

$\Rightarrow x+a=0 \text{ or } 4x+2b=0$

$\Rightarrow x=-a \text{ or } x=-\frac{b}{2}$

Hence, $-a$ and $-\frac{b}{2}$ are the roots of the give equation.

57. $\frac{x+3}{x-2}-\frac{1-x}{x}=4\frac{1}{4}, x\neq 2,0$

Sol:

Given:

$$\frac{(x+3)}{(x-2)}-\frac{(1-x)}{x}=\frac{17}{4}$$

$$\Rightarrow \frac{x(x+3)-(1-x)(x-2)}{(x-2)x}=\frac{17}{4}$$

$$\Rightarrow \frac{x^2+3x-(x-2-x^2+2x)}{x^2-2x}=\frac{17}{4}$$

$$\Rightarrow \frac{x^2+3x+x^2-3x+2}{x^2-2x}=\frac{17}{4}$$

$$\Rightarrow \frac{2x^2+2}{x^2-2x}=\frac{17}{4}$$

$$\Rightarrow 8x^2+8=17x^2-34x \quad \text{[On cross multiplying]}$$

$$\Rightarrow -9x^2+34x+8=0$$

$$\Rightarrow 9x^2-34x-8=0$$

$$\Rightarrow 9x^2-36x+2x-8=0$$

$$\Rightarrow 9x(x-4)+2(x-4)=0$$

$$\Rightarrow (x-4)(9x+2)=0$$

$$\Rightarrow x-4=0 \text{ or } 9x+2=0$$

$$\Rightarrow x=4 \text{ or } x=\frac{-2}{9}$$

Hence, the roots of the equation are 4 and $\frac{-2}{9}$.

58. $\frac{3x-4}{7}+\frac{7}{3x-4}=\frac{5}{2}, x\neq\frac{4}{3}$

Sol:

$$\frac{3x-4}{7}+\frac{7}{3x-4}=\frac{5}{2}, x\neq\frac{4}{3}$$

$$\Rightarrow \frac{(3x-4)^2+49}{7(3x-4)}=\frac{5}{2}$$

$$\Rightarrow \frac{9x^2-24x+16+49}{21x-28}=\frac{5}{2}$$

$$\Rightarrow \frac{9x^2-24x+65}{21x-28}=\frac{5}{2}$$

$$\Rightarrow 18x^2-48x+130=105x-140$$

$$\Rightarrow 18x^2-153x+270=0$$

$$\Rightarrow 2x^2-17x+30=0$$

$$\Rightarrow 2x^2-12x-5x+30=0$$

$$\Rightarrow 2x(x-6)-5(x-6)=0$$

$$\Rightarrow (x-6)(2x-5)=0$$

$$\Rightarrow x-6=0 \text{ or } 2x-5=0$$

$$\Rightarrow x=6 \text{ or } x=\frac{5}{2}$$

Hence, 6 and $\frac{5}{2}$ are the roots of the given equation.

59. $\frac{x}{x-1}+\frac{x-1}{x}=4\frac{1}{4}, x\neq 0,1$

Sol:

$$\frac{x}{x-1}+\frac{x-1}{x}=4\frac{1}{4}, x\neq 0,1$$

$$\Rightarrow \frac{x^2+(x-1)^2}{x(x-1)}=\frac{17}{4}$$

$$\Rightarrow \frac{x^2+x^2-2x+1}{x^3-x}=\frac{17}{4}$$

$$\Rightarrow \frac{2x^2-2x+1}{x^2-1}=\frac{17}{4}$$

$$\Rightarrow 8x^2-8x+4=17x^2-17x$$

$$\Rightarrow 9x^2-9x-4=0$$

$$\Rightarrow 9x^2-12x+3x-4=0$$

$$\Rightarrow 3x(3x-4)+1(3x-4)=0$$

$$\Rightarrow (3x-4)(3x+1)=0$$

$$\Rightarrow 3x-4=0 \text{ or } 3x+1=0$$

$$\Rightarrow x=\frac{4}{3} \text{ or } x=-\frac{1}{3}$$

Hence, $\frac{4}{3}$ and $-\frac{1}{3}$ are the roots of the given equation.

60. $\frac{x}{x+1}+\frac{x+1}{x}=2\frac{4}{15}, x\neq 0,-1$

Sol:

$\frac{x}{x+1}+\frac{x+1}{x}=2\frac{4}{15}, x\neq 0,-1$

$\Rightarrow \frac{x^2+(x+1)^2}{x(x+1)}=\frac{34}{15}$

$\Rightarrow \frac{x^2+x^2+2x+1}{x^2+x}=\frac{34}{15}$

$\Rightarrow \frac{2x^2+2x+1}{x^2+x}=\frac{34}{15}$

$\Rightarrow 30x^2+30x+15=34x^2+34x$

$\Rightarrow 4x^2+4x-15=0$

$\Rightarrow 4x^2+10x-6x-15x=0$

$\Rightarrow 2x(2x+5)-3(2x+5)=0$

$\Rightarrow (2x+5)(2x-3)=0$

$\Rightarrow 2x+5=0 \text{ or } 2x-3=0$

$\Rightarrow x=-\frac{5}{2} \text{ or } 2x-3=0$

Hence, $-\frac{5}{2}$ and $\frac{3}{2}$ are the roots of the given equation.

61. $\frac{x-4}{x-5}+\frac{x-6}{x-7}=3\frac{1}{3}, x\neq 5,7$

Sol:

$\frac{x-4}{x-5}+\frac{x-6}{x-7}=3\frac{1}{3}, x\neq 5,7$

$\Rightarrow \frac{(x-4)(x-7)+(x-5)(x-6)}{(x-5)(x-7)}=\frac{10}{3}$

$\Rightarrow \frac{x^2-11x+28+x^2-11x+30}{x^2-12x+35}=\frac{10}{3}$

$\Rightarrow \frac{2x^2-22x+58}{x^2-12x+35}=\frac{10}{3}$

$$\Rightarrow \frac{x^2-11x+29}{x^2-12x+35}=\frac{5}{3}$$
$$\Rightarrow 3x^2-33x+87=5x^2-60x+175$$
$$\Rightarrow 2x^2-27x+88=0$$
$$\Rightarrow 2x^2-16x-11x+88=0$$
$$\Rightarrow 2x(x-8)-11(x-8)=0$$
$$\Rightarrow (x-8)(2x-11)=0$$
$$\Rightarrow x-8=0 \text{ or } 2x-11=0$$
$$\Rightarrow x=8 \text{ or } x=\frac{11}{2}$$

Hence, 8 and $\frac{11}{2}$ are the roots of the given equation.

62. $\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}, x\neq 2,4$

Sol:

$$\frac{x-1}{x-2}+\frac{x-3}{x-4}=3\frac{1}{3}, x\neq 2,4$$
$$\Rightarrow \frac{(x-1)(x-4)+(x-2)(x-3)}{(x-2)(x-4)}=\frac{10}{3}$$
$$\Rightarrow \frac{x^2-5x+4+x^2-5x+6}{x^2-6x+8}=\frac{10}{3}$$
$$\Rightarrow \frac{2x^2-10x+10}{x^2-6x+8}=\frac{10}{3}$$
$$\Rightarrow \frac{x^2-5x+5}{x^2-6x+8}=\frac{5}{3}$$
$$\Rightarrow 3x^2-15x+15=5x^2-30x+40$$
$$\Rightarrow 2x^2-15x+25=0$$
$$\Rightarrow 2x^2-10x-5x+25=0$$
$$\Rightarrow 2x(x-5)-5(x-5)=0$$
$$\Rightarrow (x-5)(2x-5)=0$$
$$\Rightarrow x-5=0 \text{ or } 2x-5=0$$
$$\Rightarrow x=5 \text{ or } x=\frac{5}{2}$$

Hence, 5 and $\frac{5}{2}$ are the roots of the given equation.

63. $\frac{1}{(x-2)}+\frac{2}{(x-1)}=\frac{6}{x}, x\neq 0,1,2$

Sol:

$\frac{1}{(x-2)}+\frac{2}{(x-1)}=\frac{6}{x}$

$\Rightarrow \frac{(x-1)+2(x-2)}{(x-1)(x-2)}=\frac{6}{x}$

$\Rightarrow \frac{3x-5}{x^2-3x+2}=\frac{6}{x}$

$\Rightarrow 3x^2-5x=6x^2-18x+12$ [On cross multiplying]

$\Rightarrow 3x^2-13x+12=0$

$\Rightarrow 3x^2-(9+4)x+12=0$

$\Rightarrow 3x^2-9x-4x+12=0$

$\Rightarrow 3x(x-3)-4(x-3)=0$

$\Rightarrow (3x-4)(x-3)=0$

$\Rightarrow 3x-4=0$ *or* $x-3=0$

$\Rightarrow x=\frac{4}{3}$ *or* $x=3$

64. $\frac{1}{x+1}+\frac{2}{x+2}=\frac{5}{x+4}, x\neq -1,-2,-4$

Sol:

$\frac{1}{x+1}+\frac{2}{x+2}=\frac{5}{x+4}, x\neq -1,-2,-4$

$\Rightarrow \frac{x+2+2x+2}{(x+1)(x+2)}=\frac{5}{x+4}$

$\Rightarrow \frac{3x+4}{x^2+3x+2}=\frac{5}{x+4}$

$\Rightarrow (3x+4)(x+4)=5(x^2+3x+2)$

$\Rightarrow 3x^2+16x+16=5x^2+15x+10$

$\Rightarrow 2x^2-x-6=0$

$\Rightarrow 2x^2-4x+3x-6=0$

$\Rightarrow 2x(x-2)+3(x-2)=0$

$\Rightarrow (x-2)(2x+3)=0$

$\Rightarrow 3x^2+16x+16=5x^2+15x+10$

$\Rightarrow 2x^2-x-6=0$

$\Rightarrow 2x^2-4x+3x-6=0$

$\Rightarrow 2x(x-2)+3(x-2)=0$

$\Rightarrow (x-2)(2x+3)=0$

$\Rightarrow x-2=0 \text{ or } 2x+3=0$

$\Rightarrow x=2 \text{ or } x=-\frac{3}{2}$

Hence, 2 and $-\frac{3}{2}$ are the roots of the given equation.

65. $3\left(\frac{3x-1}{2x+3}\right)-2\left(\frac{2x+3}{3x-1}\right)=5, x\neq\frac{1}{3},-\frac{3}{2}$

Sol:

$3\left(\frac{3x-1}{2x+3}\right)-2\left(\frac{2x+3}{3x-1}\right)=5, x\neq\frac{1}{3},-\frac{3}{2}$

$\Rightarrow \frac{3(3x-1)^2-2(2x+3)^2}{(2x+3)(3x-1)}=5$

$\Rightarrow \frac{3(9x^2-6x+1)-2(4x^2+12x+9)}{6x^2+7x-3}=5$

$\Rightarrow \frac{27x^2-18x+3-8x^2-24x-18}{6x^2+7x-3}=5$

$\Rightarrow \frac{19x^2-42x-15}{6x^2+7x-3}=5$

$\Rightarrow 19x^2-42x-15=30x^2+35x-15$

$\Rightarrow 11x^2+77x=0$

$\Rightarrow 11x(x+7)=0$

$\Rightarrow x=0 \text{ or } x+7=0$

$\Rightarrow x=0 \text{ or } x=-7$

Hence, 0 and -7 are the roots of the given equation.

66. $3\left(\frac{7x+1}{5x-3}\right)-4\left(\frac{5x-3}{7x+1}\right)=11, x\neq\frac{3}{5},-\frac{1}{7}$

Sol:

$$3\left(\frac{7x+1}{5x-3}\right)-4\left(\frac{5x-3}{7x+1}\right)=11, x\neq\frac{3}{5},-\frac{1}{7}$$

$$\Rightarrow\frac{3(7x+1)^2-4(5x-3)^2}{(5x-3)(7x+1)}=11$$

$$\Rightarrow\frac{3(49x^2+14x+1)-4(25x^3-30x+9)}{35x^3-16x-3}=11$$

$$\Rightarrow\frac{147x^2+42x+3-100x^2+120x-36}{35x^2-16x-3}=11$$

$$\Rightarrow\frac{47x^2+162x-33}{35x^2-16x-3}=11$$

$$\Rightarrow 47x^2+162x-33=385x^2-176x-33$$

$$\Rightarrow 338x^2-338x=0$$

$$\Rightarrow 338x(x-1)=0$$

$$\Rightarrow x=0 \text{ or } x-1=0$$

$$\Rightarrow x=0 \text{ or } x=1$$

Hence, 0 and 1 are the roots of the given equation.

67. $\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3, x\neq-\frac{1}{2},\frac{3}{4}$

Sol:

Given:

$$\left(\frac{4x-3}{2x+1}\right)-10\left(\frac{2x+1}{4x-3}\right)=3$$

Putting $\frac{4x-3}{2x+1}=y$, we get:

$$y-\frac{10}{y}=3$$

$$\Rightarrow\frac{y^2-10}{y}=3$$

$$\Rightarrow y^2-10=3y \qquad \text{[On cross multiplying]}$$

$$\Rightarrow y^2-3y-10=0$$

$$\Rightarrow y^2-(5-2)y-10=0$$

$$\Rightarrow y^2-5y+2y-10=0$$

$$\Rightarrow y(y-5)+2(y-5)=0$$

$$\Rightarrow(y-5)(y+2)=0$$

$\Rightarrow y-5=0 \text{ or } y+2=0$

$\Rightarrow y=5 \text{ or } y=-2$

Case I:

If $y=5$, we get:

$\frac{4x-3}{2x+1}=5$

$\Rightarrow 4x-3=5(2x+1)$ [On cross multiplying]

$\Rightarrow 4x-3=10x+5$

$\Rightarrow -6x=8$

$\Rightarrow -6x=8$

$\Rightarrow x=\frac{8}{6}$

$\Rightarrow x=-\frac{4}{3}$

Case II:

If $y=-2$, we get:

$\frac{4x-3}{2x+1}=-2$

$\Rightarrow 4x-3=-2(2x+1)$

$\Rightarrow 4x-3=-4x-2$

$\Rightarrow 8x=1$

$\Rightarrow x=\frac{1}{8}$

Hence, the roots of the equation are $-\frac{4}{3}$ and $\frac{1}{8}$.

68. $\left(\frac{x}{x+1}\right)^2-5\left(\frac{x}{x+1}\right)+6=0, x\neq b, a$

Sol:

$\left(\frac{x}{x+1}\right)^2-5\left(\frac{x}{x+1}\right)+6=0$

Putting $\frac{x}{x+1}=y$, we get:

$y^2-5y+6=0$

$\Rightarrow y^2-5y+6=0$

$\Rightarrow y^2-(3+2)y+6=0$

$\Rightarrow y^2-3y-2y+6=0$

$\Rightarrow y(y-3)-2(y-3)=0$

$\Rightarrow (y-3)(y-2)=0$

$\Rightarrow y-3=0 \text{ or } y-2=0$

$\Rightarrow y=3 \text{ or } y=2$

Case I:

If $y=3$, we get

$\frac{x}{x+1}=3$

$\Rightarrow x=3(x+1)$ [On cross multiplying]

$\Rightarrow x=3x+3$

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

Case II:

If $y=2$, we get:

$\frac{x}{x+1}=2$

$\Rightarrow x=2(x+1)$

$\Rightarrow x=2x+2$

$\Rightarrow -x=2$

$\Rightarrow x=-2$

Hence, the roots of the equation are $\frac{-3}{2}$ and -2.

69. $\frac{a}{(x-b)}+\frac{b}{(x-a)}=2, x\neq b, a$

Sol:

$\frac{a}{(x-b)}+\frac{b}{(x-a)}=2$

$\Rightarrow \left[\frac{a}{(x-b)}-1\right]+\left[\frac{b}{(x-b)}-1\right]=0$

$\Rightarrow \frac{a-(x-b)}{x-b}+\frac{b-(x-b)}{x-b}=0$

$$\Rightarrow (a-x+b)\left[\frac{1}{(x-b)}+\frac{1}{(x-a)}\right]=0$$

$$\Rightarrow (a-x+b)\left[\frac{(x-a)+(x-b)}{(x-b)(x-a)}\right]=0$$

$$\Rightarrow (a-x+b)\left[\frac{2x-(a+b)}{(x-b)(x-a)}\right]=0$$

$$\Rightarrow (a-x+b)\left[2x-(a+b)\right]=0$$

$$\Rightarrow a-x+b=0 \text{ or } 2x-(a+b)=0$$

$$\Rightarrow x=a+b \text{ or } x=\frac{a+b}{2}$$

Hence, the roots of the equation are $(a+b)$ and $\left(\frac{a+b}{2}\right)$.

70. $\frac{a}{(ax-1)}+\frac{b}{(bx-1)}=(a+b), x\neq\frac{1}{a},\frac{1}{b}$

Sol:

$$\frac{a}{(ax-1)}+\frac{b}{(bx-1)}=(a+b)$$

$$\Rightarrow\left[\frac{a}{(ax-1)}-b\right]+\left[\frac{b}{(bx-1)}-a\right]=0$$

$$\Rightarrow\frac{a-b(ax-1)}{ax-1}+\frac{b-a(bx-1)}{bx-1}=0$$

$$\Rightarrow\frac{a-abx+b}{ax-1}+\frac{a-abx+b}{bx-1}=0$$

$$\Rightarrow (a-abx+b)\left[\frac{1}{ax-1}+\frac{1}{(bx-1)}\right]=0$$

$$\Rightarrow (a-abx+b)\left[\frac{(bx-1)+(ax-1)}{(ax-1)(bx-1)}\right]=0$$

$$\Rightarrow (a-abx+b)\left[\frac{(a+b)x-2}{(ax-1)(bx-1)}\right]=0$$

$$\Rightarrow (a-abx+b)\left[(a+b)x-2\right]=0$$

$$\Rightarrow a-abx+b=0 \text{ or } (a+b)x-2=0$$

$\Rightarrow x = \frac{(a+b)}{ab}$ *or* $x = \frac{2}{(a+b)}$

Hence, the roots of the equation are $\frac{(a+b)}{ab}$ and $\frac{2}{(a+b)}$.

71. $3^{(x+2)} + 3^{-x} = 10$

Sol:

$3^{(x+2)} + 3^{-x} = 10$

$3^x.9 + \frac{1}{3^x} = 10$

Let 3^x be equal to y.

$\therefore 9y + \frac{1}{y} = 10$

$\Rightarrow 9y^2 + 1 = 10y$

$\Rightarrow 9y^2 - 10y + 1 = 0$

$\Rightarrow (y-1)(9y-1) = 0$

$\Rightarrow y - 1 = 0$ *or* $9y - 1 = 0$

$\Rightarrow y = 1$ *or* $y = \frac{1}{9}$

$\Rightarrow 3x^x = 1$ *or* $3^x = \frac{1}{9}$

$\Rightarrow 3^x = 3^0$ *or* $3^x = 3^{-2}$

$\Rightarrow x = 0$ *or* $x = -2$

Hence, 0 and -2 are the roots of the given equation.

72. $4^{(x+1)} + 4^{(1-x)} = 10$

Sol:

Given:

$4^{(x+1)} + 4^{(1-x)} = 10$

$\Rightarrow 4^x.4 + 4^1.\frac{1}{4^4} = 10$

Let 4^x be y.

$\therefore 4y + \frac{4}{y} = 10$

$\Rightarrow 4y^2 - 10y + 4 = 0$

$\Rightarrow 4y^2 - 8y - 2y + 4 = 0$

$\Rightarrow 4y(y-2)-2(y-2)=0$

$\Rightarrow y=2 \text{ or } y=\frac{2}{4}=\frac{1}{2}$

$\Rightarrow 4^x=2 \text{ or } \frac{1}{2}$

$\Rightarrow 4^x=2^{2x}=2^1 \text{ or } 2^{2x}=2^{-1}$

$\Rightarrow x=\frac{1}{2} \text{ or } x=\frac{-1}{2}$

Hence, $\frac{1}{2}$ and $\frac{-1}{2}$ are roots of the given equation.

73. $2^{2x}-3.2^{(x+2)}+32=0$

Sol:

$2^{2x}-3.2^{(x+2)}+32=0$

$\Rightarrow \left(2^x\right)^2-3.2^x.2^2+32=0$

Let 2^x be y.

$\therefore y^2-12y+32=0$

$\Rightarrow y^2-8y-4y+32=0$

$\Rightarrow y(y-8)-4(y-8)=0$

$\Rightarrow (y-8)=0 \text{ or } (y-4)=0$

$\Rightarrow y=8 \text{ or } y=4$

$\therefore 2^x=8 \text{ or } 2^x=4$

$\Rightarrow 2^x=2^3 \text{ or } 2^x=2^2$

$\Rightarrow x-2 \text{ or } 3$

Hence, 2 and 3 are the roots of the given equation.

Exercise - 10B

1. $x^2-6x+3=0$

Sol:

$x^2-6x+3=0$

$\Rightarrow x^2-6x=-3$

$\Rightarrow x^2-2\times x\times 3+3^2=-3+3^2$ (Adding 3^2 on both sides)

$\Rightarrow (x-3)^2=-3+9=6$

$\Rightarrow x-3=\pm\sqrt{6}$ (Taking square root on the both sides)

$\Rightarrow x-3=\sqrt{6}$ *or* $x-3=-\sqrt{6}$

$\Rightarrow x=3+\sqrt{6}$ *or* $x=3-\sqrt{6}$

Hence, $3+\sqrt{6}$ and $3-\sqrt{6}$ are the roots of the given equation.

2. $x^2-4x+1=0$

Sol:

$x^2-4x+1=0$

$\Rightarrow x^2-4x=-1$

$\Rightarrow x^2-2\times x\times 2+2^2=-1+2^2$ (Adding 2^2 on both sides)

$\Rightarrow (x-2)^2=-1+4=3$

$\Rightarrow x-2=\pm\sqrt{3}$ (Taking square root on the both sides)

$\Rightarrow x-2=\sqrt{3}$ *or* $x-2=-\sqrt{3}$

$\Rightarrow x=2+\sqrt{3}$ *or* $x=2-\sqrt{3}$

Hence, $2+\sqrt{3}$ and $2-\sqrt{3}$ are the roots of the given equation.

3. $x^2+8x-2=0$

Sol:

$x^2+8x-2=0$

$\Rightarrow x^2+8x=2$

$\Rightarrow x^2+2\times x\times 4+4^2=2+4^2$ (Adding 4^2 on both sides)

$\Rightarrow (x+4)^2=2+16=18$

$\Rightarrow x+4=\pm\sqrt{18}=\pm 3\sqrt{2}$ (Taking square root on the both sides)

$\Rightarrow x+4=3\sqrt{2}$ *or* $x+4=-3\sqrt{2}$

$\Rightarrow x=-4+3\sqrt{2}$ *or* $x=-4-3\sqrt{2}$

Hence, $\left(-4+3\sqrt{2}\right)$ and $\left(-4-3\sqrt{2}\right)$ are the roots of the given equation.

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

Sol:

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

$\Rightarrow 4x^2+4\sqrt{3}x=-3$

$\Rightarrow (2x)^2+2\times 2x\times\sqrt{3}+\left(\sqrt{3}\right)^2=-3+\left(\sqrt{3}\right)^2$ [Adding $\left(\sqrt{3}\right)^2$ on both sides]

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

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

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

Hence, $-\frac{\sqrt{3}}{2}$ is the repeated root of the given equation.

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

Sol:

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

$\Rightarrow 4x^2+10x-6=0$ (Multiplying both sides by 2)

$\Rightarrow 4x^2+10x=6$

$\Rightarrow (2x)^2+2\times 2x\times\frac{5}{2}+\left(\frac{5}{2}\right)^2 = 6+\left(\frac{5}{2}\right)^2$ [Adding $\left(\frac{5}{2}\right)^2$ on both sides]

$\Rightarrow \left(2x+\frac{5}{2}\right)^2 = 6+\frac{25}{4} = \frac{24+25}{4} = \frac{49}{4} = \left(\frac{7}{2}\right)^2$

$\Rightarrow 2x+\frac{5}{2} = \pm\frac{7}{2}$ (Taking square root on both sides)

$\Rightarrow 2x+\frac{5}{2} = \frac{7}{2}$ *or* $2x+\frac{5}{2} = -\frac{7}{2}$

$\Rightarrow 2x = \frac{7}{2}-\frac{5}{2} = \frac{2}{3} = 1$ or $2x = -\frac{7}{2}-\frac{5}{2} = -\frac{12}{2} = -6$

$x = \frac{1}{2}$ or $x = -3$

Hence, $\frac{1}{2}$ and -3 are the roots of the given equation.

6. $3x^2-x-2=0$

Sol:

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

$\Rightarrow 9x^2-3x-6=0$ (Multiplying both sides by 3)

$\Rightarrow 9x^2-3x=6$

$\Rightarrow (3x)^2-2\times 3x\times\frac{1}{2}+\left(\frac{1}{2}\right)^2 = 6+\left(\frac{1}{2}\right)^2$ [Adding $\left(\frac{1}{2}\right)^2$ on both sides]