RD SHARMA

Solutions
Class 10 Maths

Chapter 8

Ex 8.13

Question 1: Find the roots of the equation (x – 4) (x + 2) = 0

The given equation is (x-4)(x+2)=0

Either x-4 =0 therefore x= 4

Or, x+2=0 therefore x= -2

The roots of the above mentioned quadratic equation are 4 and -2 respectively.

Question 2: Find the roots of the equation (2x+3) (3x-7)=0

The given equation is (2x+3)(3x-7)=0 .

Either 2x+3 =0, therefore $x=-32\,x = \frac{-3}{2}$

Or, 3x-7 =0, therefore $x=73\,x = \frac{7}{3}$

The roots of the above mentioned quadratic equation are $x=-32\,x = \frac{-3}{2}$ and $x=73\,x = \frac{7}{3}$ respectively.

Question 3: Find the roots of the quadratic equation $3x^2$-14x-5 = 0

The given equation is $3x^2$-14x-5 = 0

= $3x^2$-14x-5 = 0

= $3x^2$-15x+x-5 = 0

= 3x(x-5)+1(x-5) =0

= (3x+1)(x-5) = 0

Either 3x+1 =0 therefore $x=-13\,x = \frac{-1}{3}$

Or, x-5 =0 therefore x=5

The roots of the given quadratic equation are 5 and $x=-13\,x = \frac{-1}{3}$ respectively.

Question 4: Find the roots of the equation $9x^2-3x-2=0$.

The given equation is $9x^2-3x-2 =0$.

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

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

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

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

Either, $3x-2 =0$ therefore $x=23 x = \frac{2}{3}$

Or, $3x+1 = 0$ therefore $x=-13 x = \frac{-1}{3}$

The roots of the above mentioned quadratic equation are $x=23 x = \frac{2}{3}$ and $x=-13 x = \frac{-1}{3}$ respectively.

Question 5: Find the roots of the quadratic equation $1x-1-1x+5=67 \frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}$.

The given equation is $1x-1-1x+5=67 \frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}$

$= 1x-1-1x+5=67 \frac{1}{x-1} - \frac{1}{x+5} = \frac{6}{7}$

$= x+5-x+1(x-1)(x+5)=67 \frac{x+5-x+1}{(x-1)(x+5)} = \frac{6}{7}$

$= 6x^2+4x-5=67 \frac{6}{x^2+4x-5} = \frac{6}{7}$

Cancelling out the like terms on both the sides of the numerator. We get,

$= 1x^2+4x-5=17 \frac{1}{x^2+4x-5} = \frac{1}{7}$

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

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

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

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

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

Either $x+6 =0$

Therefore x= -6

Or, x-2 =0

Therefore x=2

The roots of the above mentioned quadratic equation are 2 and -6 respectively.

Question 6: Find the roots of the equation $6x^2+11x+3=0$.

The given equation is $6x^2+11x+3 =0$.

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

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

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

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

Either, 2x+3 =0 therefore $x=-32\,x = \frac{-3}{2}$

Or, 3x+1 =0 therefore $x=-13\,x = \frac{-1}{3}$

The roots of the above mentioned quadratic equation are $x=-32\,x = \frac{-3}{2}$ and $x=-13$ $x = \frac{-1}{3}$ respectively .

Question 7: Find the roots of the equation $5x^2-3x-2=0$

The given equation is $5x^2-3x-2=0$.

$= 5x^2-3x-2=0$.

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

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

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

Either 5x+2 =0 therefore $x=-25\,x = \frac{-2}{5}$

Or, x-1 =0 therefore x= 1

The roots of the above mentioned quadratic equation are 1 and $x=-25\,x = \frac{-2}{5}$ respectively.

Question 8: Find the roots of the equation $48x^2-13x-1=0$

The given equation is $48x^2-13x-1=0$.

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

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

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

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

Either $16x+1 =0$ therefore $x=-116 x = \frac{-1}{16}$

Or, $3x-1 =0$ therefore $x=13 x = \frac{1}{3}$

The roots of the above mentioned quadratic equation are $x=-116 x = \frac{-1}{16}$

And $x=13 x = \frac{1}{3}$ respectively.

Question 9: Find the roots of the equation $3x^2=-11x-10$

The given equation is $3x^2=-11x-10$

$= 3x^2=-11x-10$

$= 3x^2+11x+10 = 0$

$= 3x^2+6x+5x+10 =0$

$= 3x(x+2) +5(x+2) =0$

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

Either $3x+2 =0$ therefore $x=-23 x = \frac{-2}{3}$

Or, $x+2 =0$ therefore $x= -2$

The roots of the above mentioned quadratic equation are $x=-23 x = \frac{-2}{3}$ and -2 respectively.

Question 10

Find the roots of the equation $25x(x+1) =-4$

The given equation is 25x(x+1) =4

= 25x(x+1) =-4

= $25x^2$+25x +4 = 0

= $25x^2$+20x+5x+4 =0

= 5x (5x+4)+1(5x+4)=0

= (5x+4)(5x+1) =0

Either 5x+4 = 0 therefore x=-45 $x = \frac{-4}{5}$

Or, 5x+1 =0 therefore x=-15 $x = \frac{-1}{5}$

The roots of the quadratic equation are x=-45 $x = \frac{-4}{5}$ and x=-15 $x = \frac{-1}{5}$ respectively.

Question 12

Find the roots of the quadratic equation 1x−1x−2=3 $\frac{1}{x} - \frac{1}{x-2} = 3$

The given equation is 1x−1x−2=3 $\frac{1}{x} - \frac{1}{x-2} = 3$

= 1x−1x−2=3 $\frac{1}{x} - \frac{1}{x-2} = 3$

= x−2−xx(x−2)=3 $\frac{x-2-x}{x(x-2)} = 3$

= 2x(x−2)=3 $\frac{2}{x(x-2)} = 3$

Cross multiplying both the sides. We get,

=2 = 3x(x-2)

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

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

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

=3x2−(3+√3)x−(3−√3)x+[(√3 2)−12] $3x^2 - (3+\sqrt{3})x - (3-\sqrt{3})x + [(\sqrt{3}^2) - 1^2]$

= 3x2−(3+√3)x−(3−√3)x+[(√3 2)−12][(√3 2)−12]
$3x^2 - (3+\sqrt{3})x - (3-\sqrt{3})x + [(\sqrt{3}^2) - 1^2][(\sqrt{3}^2) - 1^2]$

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

$\sqrt{3}^2x^2-\sqrt{3}(\sqrt{3}+1)x-\sqrt{3}(\sqrt{3}-1)x+(\sqrt{3}+1)(\sqrt{3}-1)$

$= \sqrt{3}x(\sqrt{3}+1)x-(\sqrt{3}x-(\sqrt{3}+1))(\sqrt{3}-1)\sqrt{3}x(\sqrt{3}+1)x-(\sqrt{3}x-(\sqrt{3}+1))(\sqrt{3}-1)$

$= (\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)$

Either $= (\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}-1)$

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

Or, $(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)$

Therefore, $x=\sqrt{3}-1\sqrt{3}x = \frac{\sqrt{3}-1}{\sqrt{3}}$

The roots of the above mentioned quadratic equation are $x=\sqrt{3}-1\sqrt{3}x = \frac{\sqrt{3}-1}{\sqrt{3}}$ and $x=\sqrt{3}+1\sqrt{3}$ $x = \frac{\sqrt{3}+1}{\sqrt{3}}$ respectively.

Question 13

Find the roots of the quadratic equation $x-1x=3x - \frac{1}{x} = 3$

The given equation is $x-1x=3x - \frac{1}{x} = 3$

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

$= x^2-1x=3\frac{x^2-1}{x} = 3$

$= x^2-1 = 3x$

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

$= x^2-(32+32)x-1=0x^2 - (\frac{3}{2} + \frac{3}{2})x - 1 = 0$

$= x^2-3+\sqrt{3}2x-3-\sqrt{3}2x-1=0x^2 - \frac{3+\sqrt{3}}{2}x - \frac{3-\sqrt{3}}{2}x - 1 = 0$

$= x^2-3+\sqrt{3}2x-3-\sqrt{3}2x--44=0x^2 - \frac{3+\sqrt{3}}{2}x - \frac{3-\sqrt{3}}{2}x - \frac{-4}{4} = 0$

$= x^2-3+\sqrt{3}2x-3-\sqrt{3}2x-9-134=0x^2 - \frac{3+\sqrt{3}}{2}x - \frac{3-\sqrt{3}}{2}x - \frac{9-13}{4} = 0$

$= x^2 - \frac{3+\sqrt{3}}{2}x - \frac{3-\sqrt{3}}{2}x - \frac{(3)^2-(\sqrt{13}^2)}{(2)^2} = 0$

$= x^2 - \frac{3+\sqrt{3}}{2}x - \frac{3-\sqrt{3}}{2}x + (\frac{3+\sqrt{13}}{2})(\frac{3-\sqrt{13}}{2}) = 0$

$= (x - \frac{3+\sqrt{13}}{2})(x - \frac{3-\sqrt{13}}{2}) = 0$

Either $(x - \frac{3+\sqrt{13}}{2}) = 0$

Therefore $\frac{3+\sqrt{13}}{2}$

Or, $(x - \frac{3-\sqrt{13}}{2}) = 0$

Therefore $\frac{3-\sqrt{13}}{2}$

The roots of the above mentioned quadratic equation are $\frac{3+\sqrt{13}}{2}$ and $\frac{3-\sqrt{13}}{2}$ respectively.

Question 14

Find the roots of the quadratic equation $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

The given equation is $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$= \frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$= \frac{x-7-x-4}{(x+4)(x-7)} = \frac{11}{30}$

$= \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$

Cancelling out the like numbers on both the sides of the equation

$= \frac{-1}{(x+4)(x-7)} = \frac{1}{30}$

$= x^2-3x-28 = -30$

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

$= x^2-2x-x-2 = 0$

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

= (x-2)(x-1) =0

Either x-2 = 0

Therefore x= 2

Or, x-1 = 0

Therefore x= 1

The roots of the above mentioned quadratic equation are 1 and 2 respectively.

Question 16

Find the roots of the quadratic equation $a^2x^2-3abx+2b^2=0$

The given equation is $a^2x^2-3abx+2b^2=0$

= $a^2x^2-3abx+2b^2=0$

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

= ax(ax-b)-2b(ax-b) =0

= (ax-b)(ax-2b) =0

Either ax-b=0 therefore x= $\frac{b}{a}$

Or, ax-2b =0 therefore x= $\frac{2b}{a}$

The roots of the quadratic equation are x= $\frac{2b}{a}$ and x= $\frac{b}{a}$ respectively.

Question 18

Find the roots of the $4x^2+4bx-(a^2-b^2) =0$

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

= -2(a-b) * 2(a+b)

=2(b-a) * 2(b+a)

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

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

= 2x(2x+(b-a)) +(a+b)(2x+(b-a)) = 0

= (2x+(b-a))(2x+b+a) = 0

Either, (2x+(b-a)) = 0

Therefore x= a−b2 $x = \frac{a-b}{2}$

Or, (2x+b+a) =0

Therefore x= −a−b2 $x = \frac{-a-b}{2}$

The roots of the above mentioned quadratic equation are x= −a−b2 $x = \frac{-a-b}{2}$ and x= a−b2 $x = \frac{a-b}{2}$ respectively.

Question 19

Find the roots of the equation $ax^2+(4a^2-3b)x -12ab =0$

The given equation is $ax^2+(4a^2-3b)x -12ab =0$

= $ax^2+(4a^2-3b)x -12ab =0$

= $ax^2+4a^2x-3bx -12ab =0$

= ax(x-4a) – 3b(x-4a) =0

= (x-4a)(ax-4b) = 0

Either x-4a =0

Therefore x= 4a

Or, ax-4b = 0

Therefore x= 4ba $x = \frac{4b}{a}$

The roots of the above mentioned quadratic equation are x= 4ba $x = \frac{4b}{a}$ and 4a respectively.

Question 22

Find the roots of x+3x+2=3x−72x−3 $\frac{x+3}{x+2} = \frac{3x-7}{2x-3}$

The given equation is x+3x+2=3x−72x−3 $\frac{x+3}{x+2} = \frac{3x-7}{2x-3}$

= =(x+3)(2x-3)=(x+2){3x-7)

=$2x^2$-3x+6x-9=$3x^2$-x-14

=$2x^2$+3x-9=$3x^2$-x-14

=x^2-3x-x-14+9=0

= x^2-5x+x-5 = 0

=x(x-5)+1(x-5)=0

=(x-5) (x+I)-0

Either x-5-0 or x+1=0

x=5 and x=-1

The roots of the above mentioned quadratic equation are 5 and -1 respectively.

Question 23

Find the roots of the equation $\frac{2x}{x-4} + \frac{2x-5}{x-3} = \frac{25}{3}$

The given equation is $\frac{2x}{x-4} + \frac{2x-5}{x-3} = \frac{25}{3}$

= $\frac{2x(x-3)+(2x-5)(x-4)}{(x-4)(x-3)} = \frac{25}{3}$

= $\frac{2x^2-6x+2x^2-5x-8x+20}{x^2-4x-3x+12} = \frac{25}{3}$

= $\frac{4x^2-19x+20}{x^2-7x+12} = \frac{25}{3}$

= 3($4x^2$-19x+20) = 25(x^2-7x+12)

= 12x^2-57x+60 = 25x^2 – 175x+300

= 13x^2-78x-40x+240=0

= 13x^2-118x+240=0

= 13x^2-78x-40x+240=0

= 13x(x-6)-40(x-6) =0

= (x-6)(13x-40) =0

Either x-6 = 0 therefore x= 6

Or , 13x-40 = 0 therefore x = $4013\frac{40}{13}$

The roots of the above mentioned quadratic equation are 6 and $4013\frac{40}{13}$ respectively.

Question 24

Find the roots of the quadratic equation $x+3x-2-1-xx=174$ $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4}$

The given equation is $x+3x-2-1-xx=174$ $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4}$

= $x(x+3)-(x-2)(1-x)x(x-2)=174$ $\frac{x(x+3)-(x-2)(1-x)}{x(x-2)}=\frac{17}{4}$

= $x^2+3x-x+x^2+2-2xx^2-2x=174$ $\frac{x^2+3x-x+x^2+2-2x}{x^2-2x}=\frac{17}{4}$

= $2x^2+2x^2-2x=174$ $\frac{2x^2+2}{x^2-2x}=\frac{17}{4}$

= $4(2x^2+2) = 17(x^2-2x)$

= $8x^2+8 = 17x^2-34x$

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

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

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

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

Either 9x+2 = 0 therefore $x=-29x=\frac{-2}{9}$

Or, x-4 = 0 therefore x= 4

The roots of the above mentioned quadratic equation are $x=-29x=\frac{-2}{9}$ and 4 respectively.

Question 26

Find the roots of the quadratic equation $1x-2+2x-1=6x$ $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

The equation is $1x-2+2x-1=6x$ $\frac{1}{x-2}+\frac{2}{x-1}=\frac{6}{x}$

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

$= \frac{(x-1)+2x-4}{(x^2-2x-x+2)} = \frac{6}{x}$

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

$= x(3x-5) = 6(x^2-3x+2)$

$= 3x^2-5x = 6x^2-18x+12$

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

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

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

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

Either x-3 = 0 therefore x= 3

Or, 3x-4 = 0 therefore $43\frac{4}{3}$

The roots of the above mentioned quadratic equation are 3 and $43\frac{4}{3}$ respectively.

Question 27

Find the roots of the quadratic equation $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

The equation is $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$

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

$= \frac{4x}{x^2-1} = \frac{5}{6}$

$= 6(4x) = 5(x^2-1)$

$= 24x = 5x^2-5$

$= 5x^2-24x-5 = 0$

$= 5x^2-25x+x-5 = 0$

$= 5x(x-5)+1(x-5) = 0$

$= (5x+1)(x-5) = 0$

Either x-5 =0

Therefore x= 5

Or, 5x+1 = 0

Therefore x= $-15 \mathrm{x} = \frac{-1}{5}$

The roots of the above mentioned quadratic equation are x= $-15 \mathrm{x} = \frac{-1}{5}$ and 5 respectively.

Question 28

Find the roots of the quadratic equation $\mathbf{x-12x+1+2x+1x-1=52}\ \frac{x-1}{2x+1} + \frac{2x+1}{x-1} = \frac{5}{2}$

The equation is $x-12x+1+2x+1x-1=52\ \frac{x-1}{2x+1} + \frac{2x+1}{x-1} = \frac{5}{2}$

= $(x-1)^2+(2x+1)^2 2x^2-2x+x-1=52\ \frac{(x-1)^2+(2x+1)^2}{2x^2-2x+x-1} = \frac{5}{2}$

= $x^2-2x+1+4x^2+4x+12x^2-x-1=52\ \frac{x^2-2x+1+4x^2+4x+1}{2x^2-x-1} = \frac{5}{2}$

= $5x^2+2x+22x^2-x-1=52\ \frac{5x^2+2x+2}{2x^2-x-1} = \frac{5}{2}$

= $2(5x^2+2x+2) = 5(2x^2-x-1)$

= $10x^2+4x+4 = 10x^2-5x-5$

Cancelling out the equal terms on both sides of the equation. We get,

= 4x+5x+4+5=0

= 9x+9=0

= 9x = -9

X = -1

X = -1 is the only root of the given equation.

Question 44

Find the roots of the quadratic equation $\mathbf{mn\,x^2+nm=1-2x}\ \frac{m}{n}x^2 + \frac{n}{m} = 1 - 2x$

The given equation is $mn\,x^2+nm=1-2x\ \frac{m}{n}x^2 + \frac{n}{m} = 1 - 2x$

$= \frac{m}{n}x^2 + \frac{n}{m} = 1 - 2x$

$= \frac{m^2x^2+n^2}{mn} = 1 - 2x$

$= m^2x^2+2mnx+(n^2-mn) = 0$

Now we solve the above quadratic equation using factorization method

Therefore

$(m^2x^2 + mnx + m\sqrt{mnx}) + (mnx - m\sqrt{mnx}(n + \sqrt{mn})(n - \sqrt{mn})) = 0$

$(m^2x^2 + mnx + m\sqrt{mnx}) + (mx(n - \sqrt{mn}) + (n + \sqrt{mn})(n - \sqrt{mn})) = 0$

$(m^2x^2 + mnx + m\sqrt{mnx}) + (mx(n - \sqrt{mn}) + (n + \sqrt{mn})(n - \sqrt{mn})) = 0$

$mx(mx + n + \sqrt{mn}) + (n - \sqrt{mn})(mx + n + \sqrt{mn}) = 0$

$= (mx+n+\sqrt{mn})(mx+n-\sqrt{mn})=0(mx + n + \sqrt{mn})(mx + n - \sqrt{mn}) = 0$

Now, one of the products must be equal to zero for the whole product to be zero for the whole product to be zero. Hence, we equate both the products to zero in order to find the value of x .

Therefore,

$(mx+n+\sqrt{mn})=0(mx + n + \sqrt{mn}) = 0$ $mx=-n-\sqrt{mn}mx = -n - \sqrt{mn}$ $x=\frac{-n-\sqrt{mn}}{m}$
$x = \frac{-n-\sqrt{mn}}{m}$

Or

$(mx+n-\sqrt{mn})=0(mx + n - \sqrt{mn}) = 0$

$x=\frac{-n+\sqrt{mn}}{m}x = \frac{-n+\sqrt{mn}}{m}$ $x=\frac{-n+\sqrt{mn}}{m}x = \frac{-n+\sqrt{mn}}{m}$

The roots of the above mentioned quadratic equation are $x=\frac{-n+\sqrt{mn}}{m}x = \frac{-n+\sqrt{mn}}{m}$ and $x=\frac{-n-\sqrt{mn}}{m}$
$x = \frac{-n-\sqrt{mn}}{m}$ respectively.

Question 45

Find the roots of the quadratic equation $\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$ $\frac{x-a}{x-b} + \frac{x-b}{x-a} = \frac{a}{b} + \frac{b}{a}$

The given equation is $\frac{x-a}{x-b}+\frac{x-b}{x-a}=\frac{a}{b}+\frac{b}{a}$ $\frac{x-a}{x-b} + \frac{x-b}{x-a} = \frac{a}{b} + \frac{b}{a}$

$= \frac{x-a}{x-b} + \frac{x-b}{x-a} = \frac{a}{b} + \frac{b}{a}$

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

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

$= (2x^2-2x(a+b)+a^2+b^2)ab = (a^2+b^2)(x^2-(a+b)x+ab)$

$= (2abx^2-2abx(a+b)+ab(a^2+b^2)) = (a^2+b^2)(x^2-(a^2+b^2)(a+b)x+(a^2+b^2)(ab)$

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

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

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

$= x(x-(a+b))=0$

Either x= 0

Or, (x-(a+b))=0

Therefore x= a+b

The roots of the above mentioned quadratic equation are 0 and a+b respectively.

Question 46

Find the roots of the quadratic equation $\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} + \frac{1}{(x-3)(x-4)} = \frac{1}{6}$

The given equation is $\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} + \frac{1}{(x-3)(x-4)} = \frac{1}{6}$

$= \frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} + \frac{1}{(x-3)(x-4)} = \frac{1}{6}$

$= \frac{(x-3)(x-4)+(x-1)(x-4)+(x-1)(x-2)}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= \frac{(x-3)(x-4)+(x-1)[(x-4)+(x-2)]}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= \frac{(x-3)(x-4)+(x-1)(2x-6)}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= \frac{(x-3)(x-4)+(x-1)2(x-3)}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= (x-3)[(x-4)+(2x-2)](x-1)(x-2)(x-3)(x-3)(x-4) = 16 \frac{(x-3)[(x-4)+(2x-2)]}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= (x-3)(3x-6)(x-1)(x-2)(x-3)(x-3)(x-4) = 16 \frac{(x-3)(3x-6)}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

$= 3(x-3)(x-2)(x-1)(x-2)(x-3)(x-3)(x-4) = 16 \frac{3(x-3)(x-2)}{(x-1)(x-2)(x-3)(x-3)(x-4)} = \frac{1}{6}$

Cancelling out the like terms on both the sides of numerator and denominator. We get,

$= 3(x-1)(x-2)(x-4) = 16 \frac{3}{(x-1)(x-2)(x-4)} = \frac{1}{6}$

$= (x-1)(x-4) = 18$

$= x^2-4x-x+4 = 18$

$= x^2-5x-14=0$

$= x^2-7x+2x-14=0$

$= x(x-7)+2(x-7)=0$

$= (x-7)(x+2)=0$

Either x-7 = 0

Therefore x=7

Or, x+2 =0

Therefore x= -2

The roots of the above mentioned quadratic equation are 7 and -2 respectively.

Question 49

Find the roots of the quadratic equation $\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}$

The given equation is $\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}$

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

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

$= ax-ab+bx-ab(x^2-bx-ax+ab) = 2cx-c \frac{ax-ab+bx-ab}{(x^2-bx-ax+ab)} = \frac{2c}{x-c}$

$= (x-c)(ax-2ab+bx) = 2c(x^2-bx-ax+ab)$

= $(a+b)x^2-2abx-(a+b)cx+2abc= 2cx^2-2c(a+b)x+2abc$

Question 50

Find the roots of the Question $x^2+2ab=(2a+b)x$

The given equation is $x^2+2ab=(2a+b)x$

= $x^2+2ab = (2a+b)x$

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

= $x^2-2ax-bx+2ab = 0$

= $x(x-2a)-b(x-2a) =0$

= $(x-2a)(x-b) =0$

Either $x-2a = 0$

Therefore $x= 2a$

Or, $x-b =0$

Therefore $x= b$

The roots of the above mentioned quadratic equation are 2a and b respectively.

Question 51

Find the roots of the quadratic equation $(a+b)^2x^2-4abx-(a-b)^2=0$

The given equation is $(a+b)^2x^2-4abx-(a-b)^2 =0$

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

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

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

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

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

Either $x-1 =0$

Therefore $x= 1$

Or, $(a+b)^2x+(a+b)^2) =0$

Therefore $-(\frac{a-b}{a+b})^2-(\frac{a-b}{a+b})^2$

The roots of the above mentioned quadratic equation are $-(\frac{a-b}{a+b})^2-(\frac{a-b}{a+b})^2$ and 1 respectively .

Question 52

Find the roots of the quadratic equation $a(x^2+1)-x(a^2+1)= 0$

The given equation is $a(x^2+1)-x(a^2+1)= 0$

$= a(x^2+1)-x(a^2+1)= 0$

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

$= ax(x-a)-1(x-a) =0$

$= (x-a)(ax-1) =0$

Either $x-a =0$

Therefore $x= a$

Or, $ax-1 =0$

Therefore $x=\frac{1}{a}x = \frac{1}{a}$

The roots of the above mentioned quadratic equation are (a) and $x=\frac{1}{a}x = \frac{1}{a}$ respectively.

Question 54

Find the roots of the quadratic equation $x^2+(a+\frac{1}{a})x+1=0x^2 + (a + \frac{1}{a})x + 1 = 0$

The given equation is $x^2+(a+\frac{1}{a})x+1=0x^2 + (a + \frac{1}{a})x + 1 = 0$

$= x^2+(a+\frac{1}{a})x+1=0x^2 + (a + \frac{1}{a})x + 1 = 0$

$= x^2+ax+\frac{x}{a}+(a\times\frac{1}{a})=0x^2 + ax + \frac{x}{a} + (a \times \frac{1}{a}) = 0$

$= x(x+a)+\frac{1}{a}(x+a)=0x(x + a) + \frac{1}{a}(x + a) = 0$

$= (x+a)(x+\frac{1}{a})=0(x + a)(x + \frac{1}{a}) = 0$

Either x+a = 0

Therefore x= -a

Or , (x+ 1a)=0$(x + \frac{1}{a}) = 0$

Therefore x= 1a $x = \frac{1}{a}$

The roots of the above mentioned quadratic equation are x= 1a $x = \frac{1}{a}$ and –a respectively.

Question 55

Find the roots of the quadratic equation $abx^2+(b^2-ac)x-bc =0$

The given equation is $abx^2+(b^2-ac)x-bc =0$

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

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

= bx (ax+b)-c (ax+b)=0

= (ax+b)(bx-c) = 0

Either, ax+b = 0

Therefore x= –ba $x = \frac{-b}{a}$

Or, bx-c = 0

Therefore x= cb $x = \frac{c}{b}$

The roots of the above mentioned quadratic equation are x= cb $x = \frac{c}{b}$ and x= –ba $x = \frac{-b}{a}$ respectively.

Question 56

Find the roots of the quadratic equation $a^2b^2x^2+b^2x-a^2x-1=0$

The given equation is $a^2b^2x^2+b^2x-a^2x-1=0$

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

= $b^2x(a^2x+1)-1(a^2x+1)$

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

Either $(a^2x+1) =0$

Therefore $x=-1a^2 x = \frac{-1}{a^2}$

Or, $(b^2x-1) =0$

Therefore $x=1b^2 x = \frac{1}{b^2}$

The roots of the above mentioned quadratic equation are $x=1b^2 x = \frac{1}{b^2}$ and $x=-1a^2 x = \frac{-1}{a^2}$ respectively.