Exercise 8.3

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Solve the following quadratic equation by factorization:

1. (x – 4)(x + 2) = 0

Solution:

Given,
(x - 4) (x + 2) = 0
So, either x - 4 = 0 ⇒ x = 4
Or, x + 2 = 0, ⇒ x = - 2
Thus, the roots of the given quadratic equation are 4 and -2 respectively.

2. (2x + 3) (3x - 7) = 0

Solution:

Given,
(2x + 3) (3x - 7) = 0.
So, either 2x + 3 = 0, ⇒ x = - 3/2
Or, 3x -7 = 0, ⇒ x = 7/3
Thus, the roots of the given quadratic equation are x = -3/2 and x = 7/3 respectively.

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

Solution:

Given.
$3x^2 - 14x - 5 = 0$
⇒ $3x^2 - 14x - 5 = 0$
⇒ $3x^2 - 15x + x - 5 = 0$
⇒ $3x(x - 5) + 1(x - 5) = 0$
⇒ $(3x + 1)(x - 5) = 0$

Now, either 3x + 1 = 0 ⇒ x = -1/3
Or, x - 5 = 0 ⇒ x = 5
Thus, the roots of the given quadratic equation are 5 and x = - 1/3 respectively.

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

Solution:

Given,
$9x^2 - 3x - 2 = 0$.
⇒ $9x^2 - 3x - 2 = 0$.
⇒ $9x^2 - 6x + 3x - 2 = 0$
⇒ $3x (3x - 2) + 1(3x - 2) = 0$
⇒ $(3x - 2)(3x + 1) = 0$

Now, either 3x - 2 = 0 ⇒ x = 2/3

Or, 3x + 1= 0 $\Rightarrow$ x = -1/3
Thus, the roots of the given quadratic equation are x = 2/3 and x = -1/3 respectively.

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

Solution:

Given,

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

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

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

Dividing by 6 both the sides and cross-multiplying we get

$x^2+ 4x – 12 = 0$
$\Rightarrow$ $x^2 + 6x - 2x – 12 = 0$
$\Rightarrow$ $x(x + 6) - 2(x - 6) = 0$
$\Rightarrow$ $(x + 6)(x - 2) = 0$
Now, either x + 6 = 0 $\Rightarrow$x = -6
Or, x - 2 = 0 $\Rightarrow$ x = 2
Thus, the roots of the given quadratic equation are 2 and – 6 respectively.

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

Given equation is $6x^2 + 11x + 3 = 0$.
$\Rightarrow$ $6x^2 + 9x + 2x + 3 = 0$
$\Rightarrow$ $3x (2x + 3) + 1(2x + 3) = 0$
$\Rightarrow$ $(2x +3) (3x + 1) = 0$
Now, either 2x + 3 = 0 $\Rightarrow$ x = -3/2
Or, 3x + 1= 0 $\Rightarrow$ x = -1/3
Thus, the roots of the given quadratic equation are x = -3/2 and x = -1/3 respectively.

7. $5x^2 - 3x - 2 = 0$
Solution:

Given equation is $5x^2 - 3x - 2 = 0$.
$\Rightarrow$ $5x^2 - 3x - 2 = 0$.
$\Rightarrow$ $5x^2 - 5x + 2x - 2 = 0$

⇒ 5x(x - 1) + 2(x - 1) = 0
⇒ (5x + 2)(x - 1) = 0
Now, either 5x + 2 = 0 ⇒x = -2/5
Or, x -1= 0 ⇒x = 1
Thus, the roots of the given quadratic equation are 1 and x = -2/5 respectively.

8. $48x^2 - 13x - 1 = 0$
Solution:

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 ⇒ x = -1/16
Or, 3x – 1=0 ⇒ x = 1/3
Thus, the roots of the given quadratic equation are x = -1/16 and x = 1/3 respectively.

9. $3x^2 = -11x - 10$
Solution:

Given equation is $3x^2 = -11x - 10$
⇒ $3x^2 + 11x + 10 = 0$
⇒ $3x^2 + 6x + 5x + 10 = 0$
⇒ 3x(x + 2) + 5(x + 2) = 0
⇒ (3x + 5)(x + 2) = 0
Now, either 3x + 2 = 0 ⇒ x = -5/3
Or, x + 2 = 0 ⇒ x = -2
Thus, the roots of the given quadratic equation are x = -2/3 and -2 respectively.

10. 25x(x + 1) = - 4
Solution:

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
Now, either 5x + 4 = 0 therefore x = - 4/5
Or, 5x + 1 = 0 therefore x = -1 /5
Thus, the roots of the given quadratic equation are x = - 4/5 and x = -1/5 respectively.

11. 16x – 10/x = 27
Solution:

Given,
16x – 10/x = 27
On multiplying x on both the sides we have,
⇒ $16x^2 – 10 = 27x$
⇒ $16x^2 – 27x – 10 = 0$
⇒ $16x^2 – 32x + 5x – 10 = 0$
⇒ $16x(x - 2) +5(x – 2) = 0$
⇒ $(16x + 5) (x - 2) = 0$
Now, either $16x + 5 = 0$ ⇒ $x = -5/16$
Or, $x – 2 = 0$ ⇒ $x = 2$
Thus, the roots of the given quadratic equation are $x = - 5/16$ and $x = 2$ respectively.

12. $\frac{1}{x}-\frac{1}{x-2}=3$

Solution:

Given equation is,

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

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

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

On cross multiplying on both the sides we get,
$2 = 3x(x - 2)$
$2 = 3x^2 - 6x$
$3x^2 - 6x – 2 = 0$
⇒ $3x^2 - 3x - 3x – 2 = 0$

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

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

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

$$\sqrt{3}x(\sqrt{3}+1)x-(\sqrt{3}x-(\sqrt{3}+1))(\sqrt{3}-1)=0$$

$$(\sqrt{3}x-\sqrt{3}-1)(\sqrt{3}x-\sqrt{3}+1)(\sqrt{3}-1)=0$$

Now, either

$(\sqrt{3}x - \sqrt{3} - 1) = 0$ or $(\sqrt{3}x - \sqrt{3} + 1)(\sqrt{3} - 1) = 0$

Thus,

$x = \frac{\sqrt{3}+1}{\sqrt{3}}$ or $x = \frac{\sqrt{3}-1}{\sqrt{3}}$ are the solutions of the given quadratic equations.

13. x – 1/x = 3, x ≠ 0

Solution:

Given,

x – 1/x = 3

On multiplying x on both the sides we have,

⇒ $x^2 - 1 = 3x$

⇒ $x^2 - 3x - 1 = 0$

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

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

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

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

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

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

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

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

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

Therefore, the roots of the given quadratic equation are $\frac{3+\sqrt{13}}{2}$ and $\frac{3-\sqrt{13}}{2}$ respectively.

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

Solution:

Given,

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

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

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

Dividing by 11 both the sides and cross-multiplying we get,

⇒ $x^2 - 3x - 28 = - 30$

⇒ $x^2 - 3x - 2 = 0$

⇒ $x^2 - 2x - x - 2 = 0$

⇒ $x(x - 2) - 1(x - 2) = 0$

⇒ $(x - 2)(x - 1) = 0$

Now, either $x – 2 = 0 \Rightarrow x = 2$

Or, $x – 1 = 0 \Rightarrow x = 1$

Thus, the roots of the given quadratic equation are 1 and 2 respectively.

15. $\frac{1}{x-3}+\frac{2}{x-2}=\frac{8}{x}$

Solution:

Given,

$$\frac{1}{x-3}+\frac{2}{x-2}=\frac{8}{x}$$

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

$$\frac{3x-8}{(x-3)(x-2)}=\frac{8}{x}$$

On cross multiplying we get,

⇒ $x(3x – 8) = 8(x – 3)(x – 2)$

⇒ $3x^2 – 8x = 8(x^2 – 5x + 6)$

⇒ $8x^2 – 40x + 48 – (3x^2 – 8x) = 0$

⇒ $5x^2 – 32x + 48 = 0$

⇒ $5x^2 – 20x – 12x + 48 = 0$

⇒ $5x(x – 4) – 12(x – 4) = 0$

⇒ $(x – 4)(5x - 12) = 0$

Now, either $x - 4 = 0 \Rightarrow x = 4$
Or, $5x - 12 = 0 \Rightarrow x = 12/5$
Thus, the roots of the given quadratic equation are 12/5 and 4 respectively.

16. $a^2x^2 - 3abx + 2b^2 = 0$
Solution:

Given equation is $a^2x^2 - 3abx + 2b^2 = 0$
$\Rightarrow$ $a^2x^2 - abx - 2abx + 2b^2 = 0$
$\Rightarrow$ $ax(ax - b) - 2b(ax - b) = 0$
$\Rightarrow$ $(ax - b)(ax - 2b) = 0$
Now, either $ax - b = 0 \Rightarrow x = b/a$
Or, $ax - 2b = 0 \Rightarrow x = 2b/a$
Thus, the roots of the quadratic equation are $x = 2b/a$ and $x = b/a$ respectively.

17. $9x^2 - 6b^2x - (a^4 - b^4) = 0$
Solution:

Given,

$$9x^2 - 6b^2x - (a^4 - b^4) = 0$$

$$\Rightarrow 9x^2 - 6b^2x - (a^2 - b^2)(a^2 + b^2) = 0$$

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

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

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

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

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

Thus, the roots of the quadratic equation are $x = (b^2 - a^2)/3$ and $x = (a^2 + b^2)/3$ respectively.

18. $4x^2 + 4bx - (a^2 - b^2) = 0$
Solution:

Given,
$4x^2 + 4bx - (a^2 - b^2) = 0$
For factorizing,
$4(a^2 - b^2) = -4(a - b)(a + b) = [-2(a-b)][2(a + b)]$
$\Rightarrow$ $2(b - a)*2(b + a)$
$\Rightarrow$ $4x^2 + (2(b - a) + 2(b + a)) - (a - b)(a + b) = 0$
So, now
$4x^2 + 2(b - a)x + + 2(b + a)x + (b - a)(a + b) = 0$
$\Rightarrow$ $2x(2x + (b - a)) + (a + b)(2x + (b - a)) = 0$
$\Rightarrow$ $(2x + (b - a))(2x + b + a) = 0$

Now, either (2x + (b - a)) = 0 $\Rightarrow$x = (a - b)/2
Or, (2x + b + a) = 0 $\Rightarrow$ x = -(a + b)/2
Thus, the roots of the given quadratic equation are x = -(a + b)/2 and x = (a - b)/2 respectively.

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

Given equation is $ax^2 + (4a^2 - 3b)x - 12ab = 0$
$\Rightarrow$ $ax^2 + 4a^2x - 3bx - 12ab = 0$
$\Rightarrow$ $ax(x + 4a) - 3b(x + 4a) = 0$
$\Rightarrow$ $(x + 4a)(ax - 3b) = 0$
Now, either x + 4a = 0 $\Rightarrow$ x = -4a
Or, ax - 3b = 0 $\Rightarrow$ x = 3b/a
Thus, the roots of the given quadratic equation are x = 3b/a and -4a respectively.

20. $2x^2 + ax – a^2 = 0$
Solution:

Given,

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

Thus, the roots of the given quadratic equation are x = a/2 and -a respectively.

21. $16/x – 1 = 15/(x + 1), x \neq 0, -1$
Solution:

Given,

$$\frac{16}{x} - 1 = \frac{15}{x+1}$$
$$\Rightarrow \frac{16-x}{x} = \frac{15}{x+1}$$
$$\Rightarrow (16 - x)(x + 1) = 15x$$
$$\Rightarrow -x^2 + 16 + 15x = 15x$$
$$\Rightarrow -x^2 + 16 = 0$$
$$\Rightarrow -x^2 - 16 = 0$$

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

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

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

Thus, the roots of the given quadratic equation are x = 4 and -4 respectively.

22. $\frac{x+3}{x+2}=\frac{3x-7}{2x-3}$ **, x ≠ -2, 3/2**

Solution:

Given,

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

On cross-multiplying we get,

(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 + l) - 0

Now, either x - 5 = 0 or x + 1 = 0

⇒ x = 5 and x = -1

Thus, the roots of the given quadratic equation are 5 and -1 respectively.

23. $\frac{2x}{x-4}+\frac{2x-5}{x-3}=\frac{25}{3}$ **, x ≠ 3, 4**

Solution:

The given equation is

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

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

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

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

On cross multiplying, we have

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

$\Rightarrow 12x^2 - 57x + 60 = 25x^2 - 175x + 300$

$\Rightarrow 13x^2 - 78x - 40x + 240 = 0$

$\Rightarrow 13x^2 - 118x + 240 = 0$

$\Rightarrow 13x^2 - 78x - 40x + 240 = 0$

$\Rightarrow 13x(x - 6) - 40(x - 6) = 0$

$\Rightarrow (x - 6)(13x - 40) = 0$

Now, either $x - 6 = 0 \Rightarrow x = 6$

Or, $13x - 40 = 0 \Rightarrow x = 40/13$

Thus, the roots of the given quadratic equation are 6 and 40/13 respectively.

24. $\frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{4}$ **$x \neq 0, 2$**

Solution:

Given equation is,

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

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

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

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

On cross multiplying, we get

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

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

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

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

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

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

Now, either $9x + 2 = 0 \Rightarrow x = -2/9$

Or, $x - 4 = 0 \Rightarrow x = 4$

Thus, the roots of the given quadratic equation are x = -2/9 and 4 respectively.

25. $\frac{x-3}{x+3} - \frac{x+3}{x-3} = \frac{48}{7}, x \neq 3, x \neq -3$

Solution:

Given equation is,

$$\frac{x-3}{x+3}-\frac{x+3}{x-3}=\frac{48}{7}$$

$$\Rightarrow \frac{(x-3)^2-(x+3)^2}{(x+3)(x-3)}=\frac{48}{7}$$

$$\Rightarrow \frac{(x^2-6x+9)-(x^2+6x+9)}{x^2-9}=\frac{48}{7}$$

$$\Rightarrow \frac{x^2-6x+9-x^2-6x-9}{x^2-9}=\frac{48}{7}$$

$$\Rightarrow \frac{-12x}{x^2-9}=\frac{48}{7}$$

On cross-multiplying, we get

$7(-12x) = 48(x^2 - 9)$

$\Rightarrow$ $-84x = 48x^2 – 432$

$\Rightarrow$ $48x^2 + 84x – 432 = 0$

$\Rightarrow$ $4x^2 + 7x – 36 = 0$ dividing by 12]

$\Rightarrow$ $4x^2 + 16x – 9x – 36 = 0$

$\Rightarrow$ $4x(x + 4) – 9(x – 4) = 0$

$\Rightarrow$ $(4x – 9)(x + 4) = 0$

Now, either $4x – 9 = 0$ $\Rightarrow x = 9/4$

Or, $x + 4 = 0$ $\Rightarrow x = -4$

Thus, the roots of the given quadratic equation are $x = 9/4$ and -4 respectively.

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

Solution:

Given equation is,

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

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

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

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

On cross multiplying, we have

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

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

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

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

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

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

Now, either $x - 3 = 0 \Rightarrow x = 3$

Or, $3x - 4 = 0 \Rightarrow 4/3$.

Thus, the roots of the given quadratic equation are 3 and 4/3 respectively.

27. $\frac{x+1}{x-1}-\frac{x-1}{x+1}=\frac{5}{6}$ **, $x \neq 1, -1$**

Solution:

The given equation is,

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

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

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

On cross – multiplying we have,

$\Rightarrow$ $6(4x) = 5(x^2 - 1) = 24x$

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

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

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

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

Now, either $x - 5 = 0 \Rightarrow x = 5$

Or, $5x + 1 = 0 \Rightarrow x = -1/5$

Thus, the roots of the given quadratic equation are $x = -1/5$ and 5 respectively.

28. $\frac{x-1}{2x+1}+\frac{2x+1}{x-1}=\frac{5}{2}$ **, $x \neq 1, -1/2$**

Solution:

The given equation is,

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

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

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

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

On cross – multiplying we have,

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

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

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

$\Rightarrow$ $9x + 9 = 0$

$\Rightarrow$ $9x = -9$

Thus, $x = -1$ is the only root of the given equation.

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

Solution:

Given equation is,

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

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

$\Rightarrow 5x = 8x - 6x^2 + 12 - 9x$

$\Rightarrow 5x - 8x + 6x^2 - 12 + 9x = 0$

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

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

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

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

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

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

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

Thus, the roots of the given quadratic equation are x = 1 and x = -2 respectively.

30.
Solution:

Given equation is,

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

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

$$\frac{x^2-7x-4x+28+x^2-6x-5x+30}{x^2-7x-5x+35}$$

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

On cross-multiplying we have,

$3(2x^2 – 22x + 58) = 10(x^2 – 12x + 35)$

⇒ $6x^2 – 66x + 174 = 10x^2 – 120x + 350$

⇒ $4x^2 – 54x + 176 = 0$

⇒ $2x^2 – 27x + 88 = 0$

⇒ $2x^2 – 16x – 11x + 88 = 0$

⇒ $2x(x – 8) – 11(x + 8) = 0$

⇒ $(x – 8)(2x – 11) = 0$

Now, either x - 8 = 0 ⇒ x = 8

Or, 2x – 11 = 0 ⇒ x = 11/2

Thus, the roots of the given quadratic equation are x = 11/2 and 8 respectively.