Ex # 1.2

Q.No.01

Solve the following equations using quadratic formula:

i $2 - x^2 = 7x$

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

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

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

Compare it with, we have

$ax^2 + bx + c = 0$

Here $a = 1$, $b = 7$, $c = -2$

Now $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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$x = \dfrac{-7 \pm \sqrt{(7)^2 - 4(1)(-2)}}{2(1)}$

$x = \dfrac{-7 \pm \sqrt{49 + 8}}{2}$

$x = \dfrac{-7 \pm \sqrt{57}}{2}$

Thus solution set $= \left\{\dfrac{-7 \pm \sqrt{57}}{2}\right\}$

ii $5x^2 + 8x + 1 = 0$

$5x^2 + 8x + 1 = 0$

Compare it with, we have

$ax^2 + bx + c = 0$

Here $a = 5$, $b = 8$, $c = 1$

Now, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(5)(1)}}{2(5)}$$

$$x = \frac{-8 \pm \sqrt{64-20}}{10}$$

$$x = \frac{-8 \pm \sqrt{44}}{10}$$

$$x = \frac{-8 \pm 2\sqrt{11}}{10}$$

$$x = \frac{2(-4 \pm \sqrt{11})}{10}$$

$$x = \frac{-4 \pm \sqrt{11}}{5}$$

Thus solution set $= \left\{ \frac{-4 \pm \sqrt{11}}{5} \right\}$

iii

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

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

compare it with,

$$ax^2 + bx + c = 0$$

Here, $a = \sqrt{3}$, $b = 1$, $c = -4\sqrt{3}$

Now, $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(\sqrt{3})(-4\sqrt{3})}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{1 + 48}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm \sqrt{49}}{2\sqrt{3}}$$

$$x = \frac{-1 \pm 7}{2\sqrt{3}}$$

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$x = \frac{-1+7}{2\sqrt{3}}$, $x = \frac{-1-7}{2\sqrt{3}}$

$x = \frac{6}{2\sqrt{3}}$, $x = \frac{-8}{2\sqrt{3}}$

$x = \frac{3}{\sqrt{3}}$, $x = \frac{-4}{\sqrt{3}}$

$x = \sqrt{3}$

Thus solution set $= \{\sqrt{3}, -4/\sqrt{3}\}$

iv $4x^2 - 14 = 3x$

$4x^2 - 3x - 14 = 0$

Compare it with

$ax^2 + bx + c = 0$

Here $a = 4$, $b = -3$, $c = -14$

Now, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-14)}}{2(4)}$

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$= \frac{3 \pm \sqrt{9 + 224}}{8}$

$x = \frac{3 \pm \sqrt{233}}{8}$

Thus solution set $= \left\{\frac{3 \pm \sqrt{233}}{8}\right\}$

v $6x^2 - 3 - 7x = 0$

$6x^2 - 7x - 3 = 0$

Compare it with

$ax^2 + bx + c = 0$

Here, $a = 6$, $b = -7$, $c = -3$

Now, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2(a)}$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(6)(-3)}}{2(6)}$$

$$x = \frac{7 \pm \sqrt{49+72}}{12}$$

$$x = \frac{7 \pm \sqrt{121}}{12}$$

$$x = \frac{7 \pm 11}{12}$$

$x = \frac{7+11}{12}$, $x = \frac{7-11}{12}$

$x = \frac{18}{12}$, $x = \frac{-4}{12}$

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

Thus solution set $= \left\{\frac{3}{2}, \frac{-1}{3}\right\}$

vi $3x^2 + 8x + 2 = 0$

$3x^2 + 8x + 2 = 0$

compare it with

$ax^2 + bx + c = 0$

Here $a = 3$, $b = 8$, $c = 2$

Now, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-8 \pm \sqrt{(8)^2 - 4(3)(2)}}{2(3)}$$

$$x = \frac{-8 \pm \sqrt{64-24}}{6}$$

$$x = \frac{-8 \pm \sqrt{40}}{6}$$

$$x = \frac{-8 \pm 2\sqrt{10}}{6}$$

$$x = \frac{2(-4 \pm \sqrt{10})}{6}$$

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$$x = \frac{-4 \pm \sqrt{10}}{3}$$

Thus solution set $= \left\{ \frac{-4 \pm \sqrt{10}}{3} \right\}$

vii

$$\frac{3}{x-6} - \frac{4}{x-5} = 1$$

$$\frac{3}{x-6} - \frac{4}{x-5} = 1$$

$$\frac{3(x-5) - 4(x-6)}{(x-5)(x-6)} = 1$$

$$3x - 15 - 4x + 24 = (x-5)(x-6)$$

$$-x + 9 = x^2 - 11x + 30$$

$$x^2 - 10x + 21 = 0$$

Compare it with

$$ax^2 + bx + c = 0$$

Here $a = 1, b = -10, c = 21$

Now, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(21)}}{2(1)}$$

$$x = \frac{10 \pm \sqrt{100 - 84}}{2}$$

$$x = \frac{10 \pm \sqrt{16}}{2}$$

$$x = \frac{10 \pm 4}{2}$$

$$x = \frac{10+4}{2}, \qquad x = \frac{10-4}{2}$$

$$x = \frac{14}{2} \qquad x = \frac{6}{2}$$

$$x = 7 \qquad x = 3$$

Thus solution set $= \{7, 3\}$

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

$$\frac{x+2}{x-1} - \frac{4-x}{2x} = \frac{7}{3}$$

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

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

$$7(2x^2-2x) = 3(2x^2+4x-4x+x^2+4-x)$$

$$7(2x^2-2x) = 3(3x^2-x+4)$$

$$14x^2-14x = 9x^2-3x+12$$

$$14x^2-9x^2-14x+3x-12=0$$

$$5x^2-11x-12=0$$

compare it with,

$$ax^2+bx+c=0$$

Here $a=5$, $b=-11$, $c=-12$

Now $$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-(-11) \pm \sqrt{(-11)^2-4(5)(-12)}}{2(5)}$$

$$x = \frac{11 \pm \sqrt{121+240}}{10}$$

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$$x = \frac{11 \pm \sqrt{361}}{10}$$

$$x = \frac{11 \pm 19}{10}$$

$$x = \frac{11+19}{10} \qquad x = \frac{11-19}{10}$$

$$x = \frac{30}{10} \qquad x = \frac{-8}{10}$$

$$x = 3 \qquad x = -4/5$$

Thus solution set $= \{3, -4/5\}$

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

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

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

$$ax - a^2 + bx - b^2 = 2(x-a)(x-b)$$

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

$$ax - a^2 + bx - b^2 = 2x^2 - 2ax - 2bx + 2ab$$

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

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

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

Compare it with, we have.

$$ax^2 + bx + c = 0$$

Here, $a = 2$, $b = -3(a+b)$, $c = (a+b)^2$

Now $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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$$x = -\frac{[-3(a+b)] \pm \sqrt{[-3(a+b)]^2 - 4(2)(a+b)^2}}{2(2)}$$

$$x = \frac{3(a+b) \pm \sqrt{9(a+b)^2 - 8(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm \sqrt{(a+b)^2}}{4}$$

$$x = \frac{3(a+b) \pm (a+b)}{4}$$

$$x = \frac{3(a+b) + (a+b)}{4}, \qquad x = \frac{3(a+b) - (a+b)}{4}$$

$$x = \frac{3a+3b+a+b}{4} \qquad x = \frac{3a+3b-a-b}{4}$$

$$= \frac{4a+4b}{4} \Rightarrow \frac{4(a+b)}{4} \qquad x = \frac{2a-2b}{4}$$

$$x = a+b \qquad x = \frac{2(a-b)}{4}$$

$$x = \frac{1}{2}(a-b)$$

Thus solution set $= \left\{(a+b), \frac{1}{2}(a-b)\right\}$

X $-(l+m)-lx^2+(2l+m)x=0$

$$-(l+m)-lx^2+(2l+m)x=0$$

$$-lx^2+(2l+m)x-(l+m)=0$$

$$-[lx^2-(2l+m)x+(l+m)]=0$$

$$lx^2-(2l+m)x+(l+m)=0$$

compare it with,

$$ax^2+bx+c=0$$

$a=l$, $b=-(2l+m)$, $c=l+m$

Now, $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$$x=\frac{-[-(2l+m)]\pm\sqrt{[-(2l+m)]^2-4(l)(l+m)}}{2l}$$

$$x=\frac{(2l+m)\pm\sqrt{4l^2+4lm+m^2-4l^2-4lm}}{2l}$$

$$x=\frac{2l+m\pm\sqrt{m^2}}{2l}$$

$$x=\frac{2l+m\pm m}{2l}$$

$x=\frac{2l+m+m}{2l}$, $x=\frac{2l+m-m}{2l}$

$x=\frac{2l+2m}{2l}$, $x=\frac{2l}{2l}$

$x=\frac{2(l+m)}{2l}$, $x=1$

$x=\frac{l+m}{l}$

Thus solution set $=\left\{1,\frac{l+m}{l}\right\}$

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