13th June 2024 Homework

Chapter no 02:
"Quadratic Equations"

Exercise 2.2:

Q1: (ii) $2 - x^2 = 7x$

Sol: By Re-arranging:

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

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

$$a = 1 \quad , b = 7 \quad , c = -2$$

* By using Quadratic Formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$\Rightarrow \frac{-(7) \pm \sqrt{(7)^2 - 4(1)(-2)}}{2(1)}$$

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

$$= \frac{-7 \pm \sqrt{57}}{2}$$

$$\Rightarrow \frac{-7 + \sqrt{57}}{2} \quad , \frac{-7 - \sqrt{57}}{2}$$

Sol set $= \left\{ \frac{-7 + \sqrt{57}}{2}, \frac{-7 - \sqrt{57}}{2} \right\}$

(iii) $5x^2+8x+1=0$

Sol:- $5x^2+8x+1=0$

$ax^2+bx+c=0$

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

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

* Putting values in Quadratic Formula:-

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

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

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

$$\Rightarrow \frac{-8+\sqrt{44}}{10} \quad , \frac{-8-\sqrt{44}}{10}$$

$$\text{Sol set} = \left\{\frac{-8+\sqrt{44}}{10}, \frac{-8-\sqrt{44}}{10}\right\}$$

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

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

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

* Putting values in Quadratic Formula:-

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

$$= \frac{-1 \pm \sqrt{1 + 16(\sqrt{3})^2}}{2(\sqrt{3})}$$

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

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

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

$$\Rightarrow \frac{-1+7}{2\sqrt{3}} \quad , \quad \frac{-1-7}{2\sqrt{3}}$$

$$\frac{6}{2(\sqrt{3})} \quad , \quad \frac{-8}{2\sqrt{3}}$$

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

Sol set $= \left\{\sqrt{3}, -4/\sqrt{3}\right\}$

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

Sol:n Re-arranging:n

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

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

* Putting values in Quadratic Formula:-

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

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

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

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

$$\Rightarrow \frac{3+\sqrt{233}}{8} \quad , \frac{3-\sqrt{233}}{8}$$

$$\text{Sol set} = \left\{ \frac{3+\sqrt{233}}{8}, \frac{3-\sqrt{233}}{8} \right\}$$

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

Sol:- Arranging the values:-

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

$$a = 6 \quad , b = -7 \quad , c = -3$$

* Putting values in Quadratic Formula:-

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

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

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

$$\Rightarrow \frac{7+11}{12} \quad , \frac{7-11}{12}$$

$$\frac{18}{12} \quad , \frac{-4}{12}$$

$$3/2 \quad , -1/3$$

$$\boxed{\text{Sol set} = \{3/2 \, , -1/3\}}$$

(vii) $3x^2 + 8x + 2 = 0$

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

$a = 3 \, , \; b = 8 \, , \; c = 2$

* Using Quadratic Formula: *

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

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

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

$$= \frac{-8^{4} + 2\sqrt{10}}{6_{3}} \quad , \quad \frac{-8^{4} - 2\sqrt{10}}{6_{3}}$$

$$= \frac{-4 + 2\sqrt{10}}{3} \quad , \quad \frac{-4 - 2\sqrt{10}}{3}$$

$$= \frac{-4 + \sqrt{10}}{3} \quad , \quad \frac{-4 - \sqrt{10}}{3}$$

$$\text{Sol set} = \left\{ \frac{-4 + \sqrt{10}}{3} , \frac{-4 - \sqrt{10}}{3} \right\}$$

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

Sol: By Cross multiplication, we

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

$$\frac{3x - 15 - 4x + 24}{x^2 - 5x - 6x + 30} = 1$$

$$\frac{-1x+9}{x^2-11x+30} = 1$$

$$-1x+9 = x^2-11x+30$$

$$-1x+11x = x^2+30-9$$

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

Re-arranging:

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

$$a=1 \quad , b=10 \quad , c=21$$

* Putting values in Quadratic Formula:

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

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

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

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

$$= -6/2 \quad , -14/2$$

$= -3 \quad , -\frac{7}{2}$

Sol set $= \left\{-3 \ , -\frac{7}{2}\right\}$

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

iv) $\dfrac{x+2}{x-1} - \dfrac{4-x}{2x} = \dfrac{7}{3}$

6+2 = 2 1/3 ; 3×2=6

* Multiplying each term with $(x-1)(2x)(3)$;

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

$$(x+2)(6x) - (4-x)(x-1)(3) = 7(x-1)(2x)$$

$$6x^2 + 12x - [4x - 4 - x^2 + x](3) = 7x - 7(2x)$$

$$6x^2 + 12x - [5x - 4 - x^2](3) = 14x^2 - 14x$$

$$6x^2 + 12x - [15x - 12 - 3x^2] = 14x^2 - 14x$$

$$6x^2 + 12x - 15x + 12 + 3x^2 = 14x^2 - 14x$$

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

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

$$a = -5 \quad , b = 11 \quad , c = 12$$

* Putting values in Quadratic Formula:

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

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

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

$$= \frac{-11+19}{-10}, \frac{-11-19}{-10}$$

$$= \frac{8}{-10}, \frac{-30}{-10}$$

$$= -4/5, 3$$

$$\{\text{Sol set} = [-4/5, 3]\}$$

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

Sol:n Multiplying each term by $(x-b)(x-a)$:n

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

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

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

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

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

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

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

So,

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

Putting the values of a, b & c in Quadratic formula:-

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

$$\frac{-(-3a-3b) \pm \sqrt{9a^2+18ab+9b^2 - 8(a^2+2ab+b^2)}}{4}$$

$$= \frac{3a+3b \pm \sqrt{9a^2+18ab+9b^2 - 8a^2 - 16ab - 8b^2}}{4}$$

$(3a+3b)^2 \Rightarrow$
$(3a)^2 + 2(3a)(3b) + (3b)^2$
$9a^2 + 18ab + 9b^2$

$$= \frac{3a+3b \pm \sqrt{a^2+2ab+b^2}}{4}$$

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

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

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

$$= \frac{4a+4b}{4} , \frac{2a+2b}{4}$$

Taking "4" common in, Taking* "2" common in

$$= \frac{\cancel{4}(a+b)}{\cancel{4}} , \frac{\cancel{2}(a+b)}{\cancel{4}_2}$$

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

$$\boxed{\text{Sol set} = \left\{a+b , \frac{a+b}{2}\right\}}$$

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

Solin Re-arrange in

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

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

So,

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

* By Quadratic* Formula in

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

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

$$\frac{2l+m \pm \sqrt{4l^2+4lm+m^2-4l^2-4lm}}{2l}$$

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

$(2l+m)^2 \Rightarrow$
$(2l)^2+2(2l)(m)+(m)^2$
$4l^2+4lm+m^2$

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

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

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

* Taking "2" common in ,

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

$$= \frac{l+m}{l} \quad , 1$$

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