# Ex 14.1

**Q1**

$$x^2 + 1 = 0$$

$\Rightarrow \quad x^2 + i^2 = 0 \qquad [\because i^2 = -1]$

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

$\Rightarrow \quad x = i, -i$

**Q2**

$$9x^2 + 4 = 0$$

$\Rightarrow \quad (3x)^2 - (2i)^2 = 0 \qquad [\because i^2 = -1]$

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

$\Rightarrow \quad 3x + 2i = 0 \quad$ or $\quad 3x - 2i = 0$

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

$\therefore \quad x = \frac{-2}{3} i, \frac{2}{3} i$

**Q3**

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

Now, completing the squares, we get

$$(x + 1)^2 + 4 = 0$$

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

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

$\Rightarrow \quad (x + 1 + 2i) = 0 \qquad$ *or* $\qquad (x + 1 - 2i) = 0$

$\therefore \quad x = -1 - 2i, \quad -1 + 2i$

**Q4**

$$4x^2 - 12x + 25 = 0$$

Now, completing the squares, we get

$$(2x - 3)^2 + 16 = 0$$

$$\Rightarrow \quad (2x - 3)^2 - 4i^2 = 0$$

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

$$\Rightarrow \quad (2x - 3 + 4i) = 0 \qquad or \qquad (2x - 3 - 4i) = 0$$

$$\therefore \quad x = \frac{3}{2} + 2i, \quad \frac{3}{2} - 2i$$

**Q5**

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

Now, completing the squares, we get

$$\left(x + \frac{1}{2}\right)^2 + \frac{3}{4} = 0$$

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

$$\Rightarrow \quad \left(x + \frac{1}{2} + \frac{\sqrt{3}}{2}i\right)\left(x + \frac{1}{2} - \frac{\sqrt{3}}{2}i\right) = 0$$

$$\Rightarrow \quad \left(x + \frac{1}{2} + \frac{\sqrt{3}}{2}i\right) = 0 \qquad or \qquad \left(x + \frac{1}{2} - \frac{\sqrt{3}}{2}i\right) = 0$$

$$\therefore \quad x = \frac{-1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{-1}{2} - \frac{\sqrt{3}}{2}i$$

## Q6

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

$$\Rightarrow \quad (2x)^2 - i^2 = 0 \quad [\because i^2 = -1]$$

$$\Rightarrow \quad (2x + i)(2x - i) = 0$$

$\Rightarrow$ either $2x + i = 0$ or $2x - i = 0$

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

$$\therefore \quad x = \frac{-i}{2}, \frac{i}{2}$$

## Q7

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$$x^2 - 4x + 7 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \ldots\ldots\ldots\ldots(A)$$

where $D = b^2 - 4ac \;\; = (-4)^2 - 4.1.7 = -12$

from (A)

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

$$= \frac{4 \pm 2\sqrt{3}i}{2}$$

$$= 2 \pm \sqrt{3}i$$

$$\therefore \quad x = 2 + \sqrt{3}i,\ 2 - \sqrt{3}i$$

## Q8

$$x^2 + 2x + 2 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ............} (A)$$

where $D = b^2 - 4ac$

$$= 2^2 - 4.1.2$$
$$= 4 - 8$$
$$= -4$$

from (A)

$$x = \frac{-2 \pm \sqrt{-4}}{2}$$

$$= \frac{-2 \pm 2i}{2}$$

$$= -1 \pm i$$

$\therefore \quad x = -1 + i, \quad -1 - i$

## Q9

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ............} (A)$$

where $D = b^2 - 4ac$

$$= (-6)^2 - 4.5.2$$
$$= 36 - 40$$
$$= -4$$

from (A)

$$x = \frac{-(-6) \pm \sqrt{-4}}{2.5}$$

$$= \frac{6 \pm 2i}{10}$$

$$= \frac{3 \pm i}{5}$$

$\therefore \quad x = \frac{3}{5} + \frac{i}{5}, \quad \frac{3}{5} - \frac{i}{5}$

## Q10

$21x^2 + 9x + 1 = 0$

Comparing the given equation with the general form

$ax^2 + bx + c = 0$, we get $a = 21, b = 9, c = 1$

Substituting a and b in,

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ and } \beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$$\alpha = \frac{-9 + \sqrt{81 - 84}}{42} \text{ and } \beta = \frac{-9 - \sqrt{81 - 84}}{42}$$

$$\Rightarrow \alpha = \frac{-9 + \sqrt{-3}}{42} \text{ and } \beta = \frac{-9 - \sqrt{-3}}{42}$$

$$\Rightarrow \alpha = \frac{-9 + i\sqrt{3}}{42} \text{ and } \beta = \frac{-9 - i\sqrt{3}}{42}$$

The roots are $x = \frac{-9}{42} \pm \frac{i\sqrt{3}}{42}$

## Q11

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ............(A)}$$

where $D = b^2 - 4ac$

$$= (-1)^2 - 4.1.1$$
$$= 1 - 4$$
$$= -3$$

from (A)

$$\therefore \quad x = \frac{-(-1) \pm \sqrt{-3}}{2}$$

$$= \frac{1 \pm \sqrt{3}i}{2}$$

$$\therefore \quad x = \frac{1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{1}{2} - \frac{\sqrt{3}}{2}i$$

## Q12

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ...........}(A)$$

where $D = b^2 - 4ac$

$= 1^2 - 4.1.1$

$= 1 - 4$

$= -3$

from (A)

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

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

$$\therefore \quad x = \frac{-1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{-1}{2} - \frac{\sqrt{3}}{2}i$$

## Q13

$$17x^2 - 8x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ...........}(A)$$

where $D = b^2 - 4ac$

$= (-8)^2 - 4.17.1$

$= 64 - 68$

$= -4$

from (A)

$$x = \frac{-(-8) \pm \sqrt{-4}}{2.17}$$

$$= \frac{8 \pm 2i}{34}$$

$$= \frac{4 \pm i}{17}$$

$$\therefore \quad x = \frac{4}{17} + \frac{i}{17}, \quad \frac{4}{17} - \frac{i}{17}$$

## Q14

$$27x^2 - 10x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \;............(A)$$

where $D = b^2 - 4ac$

$$= (-10)^2 - 4.27.1$$
$$= 100 - 108$$
$$= -8$$

from (A)

$$x = \frac{-(-10) \pm \sqrt{-8}}{54}$$

$$= \frac{10 \pm 2\sqrt{2}i}{54}$$

$$= \frac{5 \pm \sqrt{2}i}{27}$$

$$\therefore \quad x = \frac{5}{27} + \frac{\sqrt{2}i}{27}, \quad \frac{5}{27} - \frac{\sqrt{2}}{27}i$$

## Q15

$$17x^2 + 28x + 12 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \;............(A)$$

where $D = b^2 - 4ac$

$$= (28)^2 - 4.17.12$$
$$= 784 - 816$$
$$= -32$$

from (A)

$$x = \frac{-28 \pm \sqrt{-32}}{2.17}$$

$$= \frac{-28 \pm 4\sqrt{2}i}{34}$$

$$\therefore \quad x = \frac{-14 \pm 2\sqrt{2}i}{17}$$

## Q16

$$21x^2 - 28x + 10 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ............} (A)$$

where $D = b^2 - 4ac$

$$= (-28)^2 - 4.21.10$$
$$= 784 - 840$$
$$= -56$$

from $(A)$

$$x = \frac{-(-28) \pm \sqrt{-56}}{2.21}$$

$$= \frac{28 \pm 2\sqrt{14}i}{42}$$

$$\therefore \quad x = \frac{2}{3} \pm \frac{\sqrt{14}}{21}i$$

## Q17

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$$8x^2 - 9x + 3 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \text{ ............} (A)$$

where $D = b^2 - 4ac$

$$= (-9)^2 - 4.8.3$$
$$= 81 - 96$$
$$= -15$$

from $(A)$

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

$$= \frac{-(-9) \pm \sqrt{-15}}{2.8}$$

$$= \frac{9 \pm \sqrt{15}i}{16}$$

Thus

$$\therefore \quad x = \frac{9 \pm \sqrt{15}i}{16}$$

## Q18

$$13x^2 + 7x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \text{............}(A)$$

where $D = b^2 - 4ac$

$$= 7^2 - 4.13.1$$
$$= 49 - 52$$
$$= -3$$

Thus, from $(A)$

$$x = \frac{-7 \pm \sqrt{-3}}{2.13}$$

$$= \frac{-7 \pm \sqrt{3}i}{26}$$

Thus

$$\therefore \quad x = \frac{-7}{26} \pm \frac{\sqrt{3}}{26} i$$

## Q19

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \text{............}(A)$$

where $D = b^2 - 4ac$

$$= 1^2 - 4.2.1$$
$$= 1 - 8$$
$$= -7$$

Thus, from $(A)$

$$x = \frac{-1 \pm \sqrt{-7}}{2.2}$$

$$= \frac{-1 \pm \sqrt{7}i}{4}$$

Thus

$$\therefore \quad x = \frac{-1}{4} \pm \frac{\sqrt{7}}{4} i$$

## Q20

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \ldots\ldots\ldots\ldots (A)$$

where $D = b^2 - 4ac$

$$= \left(-\sqrt{2}\right)^2 - 4.\sqrt{3}.3\sqrt{3}$$
$$= 2 - 36$$
$$= -34$$

from (A)

$$x = \frac{-\left(-\sqrt{2}\right) \pm \sqrt{-34}}{2.\sqrt{3}}$$

$$= \frac{\sqrt{2} \pm \sqrt{34}i}{2\sqrt{3}}$$

Thus

$$\therefore \quad x = \frac{\sqrt{2} \pm \sqrt{34}i}{2\sqrt{3}}$$

## Q21

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \ldots\ldots\ldots\ldots (A)$$

where $D = b^2 - 4ac$

$$= 1^2 - 4.\sqrt{2}.\sqrt{2}$$
$$= 1 - 8$$
$$= -7$$

from (A)

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

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

Thus

$$\therefore \quad x = \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}}$$

## Q22

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \ldots\ldots\ldots\ldots (A)$$

where $D = b^2 - 4ac$

$$= 1^2 - 4.1\frac{1}{\sqrt{2}}$$

$$= 1 - 2\sqrt{2}$$

from (A)

$$x = \frac{-1 \pm \sqrt{-\left(2\sqrt{2} - 1\right)}}{2}$$

$$= \frac{-1 \pm \sqrt{2\sqrt{2} - 1}i}{2}$$

Thus,

$$\therefore \quad x = \frac{-1 \pm \sqrt{2\sqrt{2} - 1}i}{2}$$

## Q23

$$x^2 + \frac{x}{\sqrt{2}} + 1 = 0 \qquad \Rightarrow \qquad \sqrt{2}x^2 + x + \sqrt{2} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \ldots\ldots\ldots\ldots (A)$$

$$D = b^2 - 4ac$$

$$= 1^2 - 4.\sqrt{2}.\sqrt{2}$$

$$= 1 - 8$$

$$= -7$$

from (A)

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

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

Thus,

$$\therefore \quad x = \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}}$$

## Q24

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \text{............}(A)$$

where $D = b^2 - 4ac$

$$= 1^2 - 4.\sqrt{5}.\sqrt{5}$$
$$= 1 - 20$$
$$= -19$$

from $(A)$

$$x = \frac{-1 \pm \sqrt{-19}}{2.\sqrt{5}}$$

$$= \frac{-1 \pm \sqrt{19}i}{2\sqrt{5}}$$

Thus,

$$\therefore \quad x = \frac{-1 \pm \sqrt{19}i}{2\sqrt{5}}$$

## Q25

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \text{............}(A)$$

where $D = b^2 - 4ac$

$$= 1^2 - 4.(-1).(-2)$$
$$= 1 - 8$$
$$= -7$$

from $(A)$

$$x = \frac{-1 \pm \sqrt{-7}}{2.(-1)}$$

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

Thus,

$$\therefore \quad x = \frac{-1 \pm \sqrt{7}i}{-2}$$

**Q26**

We will apply discriminate rule,

$$x=\frac{-b\pm\sqrt{D}}{2a} \qquad \text{......(A)}$$

Where $D=b^2-4ac$

$$=(-2)^2-4(1)\left(\frac{3}{2}\right)$$

$$=4-6$$

$$=-2$$

From (A)

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

$$=\frac{2\pm i\sqrt{2}}{2}$$

$$=1\pm\frac{i}{\sqrt{2}}$$

Thus,

$$\therefore x=1\pm\frac{i}{\sqrt{2}}$$

**Q27**

We will apply discriminate rule,

$$x=\frac{-b\pm\sqrt{D}}{2a} \qquad \text{......(A)}$$

Where $D=b^2-4ac$

$$=(-4)^2-4(3)\left(\frac{20}{3}\right)$$

$$=16-80$$

$$=-64$$

From (A)

$$x=\frac{-(-4)\pm\sqrt{-64}}{2(3)}$$

$$=\frac{4\pm i8}{6}$$

$$=\frac{2}{3}\pm\frac{4i}{3}$$

Thus,

$$\therefore x=\frac{2}{3}\pm\frac{4i}{3}$$

# Ex 14.2

## Q1(i)

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

$\Rightarrow \quad x^2 + 10ix + 21i^2 = 0 \qquad [\because i^2 = -1]$

$\Rightarrow \quad x^2 + 7ix + 3ix + 21i^2 = 0$

$\Rightarrow \quad x(x + 7i) + 3i(x + 7i) = 0$

$\Rightarrow \quad (x + 3i)(x + 7i) = 0$

$\therefore \; x = -3i, -7i$

## Q1(ii)

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

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

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

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

$\Rightarrow \quad x = 2i, -1$

## Q1(iii)

$x^2 - (2\sqrt{3} + 3i)x + 6\sqrt{3i} = 0$

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

$\Rightarrow \quad x(x - 2\sqrt{3}) - 3i(x - 2\sqrt{3}) = 0$

$\Rightarrow \quad (x - 3i)(x - 2\sqrt{3}) = 0$

$\Rightarrow \quad x = 3i, 2\sqrt{3}$

## Q1(iv)

$6x^2 - 17ix - 12 = 0$

$\Rightarrow \quad 6x^2 - 17ix + 12i^2 = 0 \qquad [\because i^2 = -1]$

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

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

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

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

## Q2(i)

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

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

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

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

$\Rightarrow \quad x = 2i \quad \text{or} \quad 3\sqrt{2}$

## Q2(ii)

$$x^2 - \left(5 - i\right)x + \left(18 + i\right) = 0$$

$\Rightarrow \quad x^2 - 5x - ix + 18 + i = 0$

$\Rightarrow \quad x^2 - \left(3 - 4i\right)x - \left(2 + 3i\right)x + \left(18 + i\right) = 0$

$\Rightarrow \quad x\left(x - \left(3 - 4i\right)\right) - \left(2 + 3i\right)\left(x - \left(3 - 4i\right)\right) = 0$

$\Rightarrow \quad \left(x - \left(2 + 3i\right)\right)\left(x - \left(3 - 4i\right)\right) = 0$

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

## Q2(iii)

$$\left(2 + i\right)x^2 - \left(5 - i\right)x + 2\left(1 - i\right) = 0$$

$\Rightarrow \quad \left(2 + i\right)x^2 - 2x - \left(3 - i\right)x + 2\left(1 - i\right) = 0$

$\Rightarrow \quad x\left[2 + i)x - 2\right] - \left(1 - i\right)\left[\left(2 + i\right)x - 2\right] = 0$

$\Rightarrow \quad \left[x - \left(1 - i\right)\right]\left[\left(2 + i\right)x - 2\right] = 0$

either $\left[x - \left(1 - i\right)\right] = 0 \quad \text{or} \quad \left[\left(2 + i\right)x - 2\right] = 0$

$\Rightarrow \quad x = 1 - i \quad \text{or} \quad x = \dfrac{2}{2 + i}$

$\Rightarrow \quad x = 1 - i \quad \text{or} \quad x = \dfrac{2 \times 2 - i}{\left(2 + i\right)\left(2 - i\right)}$

$\text{or} \quad x = \dfrac{4 - 2i}{4 + 1} = \dfrac{4}{5} - \dfrac{2}{5}i$

Thus,

$x = 1 - i, \qquad \dfrac{4}{5} - \dfrac{2}{5}i$

## Q2(iv)

$x^2 - (2+i)x - (1-7i) = 0$

$\Rightarrow \quad x^2 - (2+i)x - (1-7i) = 0$

$\Rightarrow \quad x^2 - (3-i)x + (1-2i)x - (1-7i) = 0$

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

$\Rightarrow \quad [x+(1-2i)][x-(3-i)] = 0$

$\Rightarrow \quad x = -1+2i, \quad 3-i$

## Q2(v)

$ix^2 - 4x - 4i = 0$

$\Rightarrow \quad ix^2 + 4i^2x + 4i^3 = 0 \quad [\because\ i^2 = -1]$

$\Rightarrow \quad x^2 + 4ix + 4i^2 = 0$

$\Rightarrow \quad x^2 + 2ix + 2ix + 4i^2 = 0$

$\Rightarrow \quad x(x+2i) + 2i(x+2i) = 0$

$\Rightarrow \quad (x+2i)(x+2i)$

$\therefore \quad x = -2i, \ -2i$

## Q2(vi)

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

$\Rightarrow \quad x^2 + 4ix + 4i^2 = 0 \quad [\because\ i^2 = -1]$

$\Rightarrow \quad x^2 + 2ix + 2ix + 4i^2 = 0$

$\Rightarrow \quad x(x+2i) + 2i(x+2i) = 0$

$\Rightarrow \quad (x+2i)(x+2i) = 0$

$\Rightarrow \quad x = -2i, -2i$

## Q2(vii)

$2x^2+\sqrt{15}ix-i=0$

Comparing the given equation with the general form

$ax^2+bx+c=0$, we get $a=2, b=\sqrt{15}i, c=-i$

Substituting a and b in,

$$\alpha=\frac{-b+\sqrt{b^2-4ac}}{2a} \quad \text{and} \quad \beta=\frac{-b-\sqrt{b^2-4ac}}{2a}$$

$$\alpha=\frac{-\sqrt{15}i+\sqrt{-15+8i}}{4} \quad \text{and} \quad \beta=\frac{-\sqrt{15}i-\sqrt{-15+8i}}{4}$$

Let $\sqrt{-15+8i}=a+bi$

$\Rightarrow -15+8i=(a+bi)^2$

$\Rightarrow -15+8i=a^2-b^2+2abi$

$\Rightarrow a^2-b^2=-15$ and $2abi=8i$

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

$\Rightarrow (a^2+b^2)^2=(-15)^2+64=289$

$\Rightarrow a^2+b^2=17$

Solving $a^2-b^2=-15$ and $a^2+b^2=17$, we get

$a^2=1$ and $b^2=16$

$\Rightarrow a=\pm1$ and $b=\pm4$

$\Rightarrow a=\pm1$ and $b=\pm4$

$\Rightarrow a=1, b=4$ or $a=-1, b=-4$

$\therefore \sqrt{-15+8i}=1+4i, -1-4i$

When $\sqrt{-15+8i}=1+4i$

$$\alpha=\frac{-\sqrt{15}i+1+4i}{4}=\frac{1+\left(4-\sqrt{15}\right)i}{4}$$

$$\text{and} \quad \beta=\frac{-\sqrt{15}i-(1+4i)}{4}=\frac{-1-\left(4+\sqrt{15}\right)i}{4}$$

When $\sqrt{-15+8i}=-1-4i$

$$\alpha=\frac{-\sqrt{15}i-1-4i}{4}=\frac{-1-\left(4+\sqrt{15}\right)i}{4}$$

$$\text{and} \quad \beta=\frac{-\sqrt{15}i-(-1-4i)}{4}=\frac{1+\left(4-\sqrt{15}\right)i}{4}$$

**Q2(viii)**

$$x^2 - x + (1+i) = 0$$
$$x^2 - x + (1+i) = 0$$
$$x^2 - ix - (1-i)x + i(1-i) = 0$$
$$(x-i)(x-(1-i)) = 0$$
$$x = i, 1-i$$

**Q2(ix)**

We will apply discriminate rule on $ax^2 + bx + c = 0$,

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

Now,

$ix^2 - x + 12i = 0$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(i)(12i)}}{2i}$$
$$= \frac{1 \pm \sqrt{1 + 48}}{2i}$$
$$= \frac{1 \pm \sqrt{49}}{2i}$$
$$= \frac{1 \pm 7}{2i}$$
$$= \frac{8}{2i}, \frac{-6}{2i}$$
$$= \frac{4}{i}, -\frac{3}{i}$$
$$= -4i,\ 3i$$

## Q2(x)

We will apply discriminate rule on $ax^2+bx+c=0$,

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

Now,

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

$$x=\frac{\left(3\sqrt{2}-2i\right)\pm\sqrt{\left[-\left(3\sqrt{2}-2i\right)\right]^2-4(1)\left(-\sqrt{2}i\right)}}{2(1)}$$

$$=\frac{\left(3\sqrt{2}-2i\right)\pm\sqrt{\left(3\sqrt{2}-2i\right)^2+4\sqrt{2}i}}{2}$$

$$=\frac{3\sqrt{2}-2i}{2}\pm\frac{4-\sqrt{2}i}{2}$$

## Q2(xi)

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

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

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

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

$$x=i,\sqrt{2}$$

## Q2(xii)

$$2x^2-(3+7i)x+(9i-3)=0$$

$$2x^2-3x-7ix+(9i-3)=0$$

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

$$\left(x-\frac{3+i}{2}\right)(x-3i)=0$$

$$x=\frac{3+i}{2},\ 3i$$