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Std - XI th D Subject - Maths - 1

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Q1)

a) $3 + i$

→ Complex conjugate of $3 + i$ is $3 - i$

b) $3 - i$

→ Complex conjugate of $3 - i$ is $3 + i$

c) $-\sqrt{5}i - \sqrt{7}i$

→ Complex conjugate of $-\sqrt{5}i - \sqrt{7}i$ is $-\sqrt{5}i + \sqrt{7}i$

d) $-\sqrt{-5}$

→ Complex conjugate of $-\sqrt{-5}$ is $\sqrt{-5}$

Q2

a) i^{35}

$(i^2)^6 (i^2) (i^2) (i)$

$(-1)^6 (-1) (-1) i$

$1 \times 1 \times i$

i

$(i^{34}) (i)$

$(i^2)^{17} (i)$

$(-1)^{17} (i)$

$-i$

b) i^{888}

$(i^2)^{444}$ $(-1)^{444} = 1$

3) i^{93}

$= i^{92}(i) = (-1)^{46}(i) = -i = i$

4) $i^{30} + i^{40} + i^{50} + i^{60}$

$= (i^2)^{15} + (i^2)^{20} + (i^2)^{25} + (i^2)^{30}$

$(-1)^{15} + (-1)^{20} + (-1)^{25} + (-1)^{30}$

$-1 + 1 - 1 + 1 = 0$

Q3

a) $(2+3i)(2-3i)$

$4 - 6i + 6i - 9i^2$

$4 - 9(-1)^2$

$4 + 9 = 13 + 0i$

$a = 13 \quad \& \quad b = 0i$

b) $\frac{i(4+3i)}{(1-i)}$

$\rightarrow \frac{i(4+3i)}{(1-i)} \times \frac{(1+i)}{(1+i)}$

$\frac{(4i+3i^2)(1+i)}{(1)^2-(i)^2}$

$\frac{4i+4i^2+3i^2+3i^2 i}{1+1} = \frac{4i-4-3-3i}{2} \quad \frac{i^2-7}{2}$

$\frac{7}{2} - \frac{i}{2}$

$\frac{7}{2} - \left(\frac{1}{2}\right)i$

$a = \frac{7}{2}$ $\quad b = -\frac{1}{2}$

Q4 $\sqrt{7+24i}$

$\sqrt{7+24i} = (a+bi)^2$

$7+24i = a^2 + 2abi + (bi)^2$

$7+24i = (a^2 - b^2) + 2abi$

equating real and imaginary we get

$a^2 - b^2 = 7$ $\quad 2abi = 24i$

$b = \frac{24}{2} = \frac{12}{a}$

$a^2 - b^2 = 7$

$a^2 - \left(\frac{12}{a}\right)^2 = 7$

$a^2 - \frac{144}{a^2} = 7$

$a^4 - 144 = 7a^2$

$a^4 - 7a^2 - 144 = 0$

$a^4 - 16a^2 + 9a^2 - 144 = 0$

$a^2(a^2 - 16) + 9(a^2 - 16)$

$(a^2 + 9) = 0 \quad (a^2 - 16) = 0$

$a^2 = -9 \qquad a^2 = 16$

$a = \pm 4$

When $a = 4 = b = \frac{12}{4} = 3$

when $a = -4 \; b = \frac{+12}{-4} = -3$

The square roots of $7 + 24i$

$4 + 3i$ or $-4 - 3i$

85 $3x^2 - 7x + 5 = 0$

$a = 3 \quad b = -7 \quad c = 5$

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

$$\frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 3 \times 5}}{2 \times 3}$$

$$\frac{7 \pm \sqrt{49 - 60}}{6}$$

$$\frac{7 \pm \sqrt{-11}}{6}$$

$$\frac{7 \pm \sqrt{11(-1)}}{6} = \frac{7 + \sqrt{11}}{6} \text{ and } \frac{7 - \sqrt{11}}{6}$$

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a) w is a complex ~~unity~~ of cube root of unity

$w^3 = 1$ and $1 + w + w^2 = 0$

a) b) $(2 - w)(2 - w^2)$

$4 - 2w^2 - 2w + w^3$

$4 - 2(w^2 + w) + 1$

$4 - 2(-1) + 1$

$4 + 2 + 1$

$7 = RHS$

b) $(a + b) + (aw + bw^2) + (aw^2 + bw) = 0$

~~$(a + b)$~~

$a + b + aw + bw^2 + aw^2 + bw$

$(a + aw + aw^2) + (b + bw + bw^2)$

$a(1 + w + w^2) + b(1 + w + w^2)$

~~$a(w^3)$~~ ~~$b(w^3)$~~

~~$a(1)$~~ ~~$b(1)$~~

$a(0) + b(0) = 0 = RHS$