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	COMPLEX NUMBERS	٦
	Class XI	
Q.11)	Where does z lies, if $\left \frac{z-5i}{z+5i} \right = 1$?	
Sol.11)	Let $z = x + iy$	
	We have, $\left \frac{z-5i}{z+5i}\right =1$	
	$\Rightarrow \frac{ z-5i }{ z+5i } = 1$	
	$\begin{vmatrix} z+5i \\ \Rightarrow z-5i = z+5i \end{vmatrix}$	
	$ \Rightarrow x + iy - 5i = x + iy + 5i $	
	$\Rightarrow x - i(y - 5) = x + i(y + 5) $	
	$\Rightarrow \sqrt{x^2 + (y - 5)^2} = \sqrt{x^2 + (y + 5)^2}$	
	Squaring	
	$\Rightarrow x^2 + y^2 + 25 - 10y = x^2 + y^2 + 25 + 10y$	
	$\Rightarrow 20y = 0$	
	$\Rightarrow y = 0$ \Rightarrow z = x lies on x - axis	
Q.12)	Evaluate: $1 + i^2 + i^4 + i^6 + \dots \dots i^{2n}$	-
Sol.12)	Evaluate: $1 + i^2 + i^4 + i^6 + \dots \dots i^{2n}$ = $1 - 1 + 1 - 1 + \dots \dots (-1)^n$	1
,	This cannot be evaluated unless value of <i>n</i> is known	
Q.13)	If $ z_1 = z_2 $, is it necessary that $z_1 = z_2$?	
Sol.13)	No. Example $z_1 = 3 + 4i \& z_2 = 4 + 3i$	
	$\Rightarrow z_1 = \sqrt{9+16} = 5$	
	$\Rightarrow z_2 = \sqrt{16 + 9} = 5$	
Q.14)	Clearly $ z_1 = z_2 $ but $ z_1 \neq z_2 $ What is the polar form of complex number $= (i^{25})^3$	-
Sol.14)	Let $z = (i^{25})^3$	_
301.11	$\Rightarrow z = (i^{-1})^3$	
	$\Rightarrow z = -i$	
	$\Rightarrow z = 0 - 1i$	
	Here, $a = 0, b = -1$	
	$\Rightarrow r = \sqrt{0+1} = 1$	
	$\Rightarrow \tan \alpha = \left \frac{-1}{0} \right = \left \frac{1}{0} \right = 0$	
	$\alpha = \frac{\pi}{2}$ since z is in 4 th quadrant	
	$\Rightarrow \theta = -\alpha \Rightarrow \theta = \frac{-\pi}{2}$	
	Polar form 2	
	$\Rightarrow z = r(\cos\theta + i\sin\theta)$	
	$\Rightarrow z = 1\left(\cos\left(\frac{-\pi}{2}\right) + i\sin\left(\frac{-\pi}{2}\right)\right)$	
	$\Rightarrow z = \cos\left(\frac{\pi}{2}\right) - i\sin\left(\frac{\pi}{2}\right) \text{ ans.}$	
Q.15)	Find the complex number satisfying the equation $z + \sqrt{z} z + 1 + i = 0$	
Sol.15)	We have, $z + \sqrt{z} z+1 + i = 0$	
	Let $z = x + iy$	

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$$\begin{array}{l} \Rightarrow x + iy + \sqrt{2}|x + iy + 1| + i = 0 \\ \Rightarrow x + iy + \sqrt{2}((x + 1) + iy) + i = 0 \\ \Rightarrow x + iy + \sqrt{2}\sqrt{(x + 1)^2 + y^2} + i = 0 \\ \Rightarrow x + iy + \sqrt{2}\sqrt{(x + 1)^2 + y^2} + i(y + 1) = 0 + 0i \\ \text{Equating real & imaginary parts} \\ \text{We get } y + 1 = 0 \\ \Rightarrow x + \sqrt{2}\sqrt{(x + 1)^2 + y^2} = 0 \\ \text{Put } y = -1 \\ \Rightarrow x + \sqrt{2}\sqrt{x^2 + 1 + 2x + 1} = 0 \\ \Rightarrow x + \sqrt{2}\sqrt{x^2 + 2x + 2} = 0 \\ \Rightarrow \sqrt{2}\sqrt{x^2 + 2x + 2} = x \\ \text{Squaring, } 2(x^2 + 2x + 2) = x^2 \\ \Rightarrow x^2 + 4x + 4 = 0 \\ \Rightarrow (x + 2)^2 = 0 \\ \Rightarrow x = -2 \\ \Rightarrow z = x + iy = -2 - i \text{ ans.} \\ \hline \textbf{Q.16} \quad \text{If } \arg(z - 1) = \arg(z + 3i) \text{ then find } x - 1; y \text{ if } z = x + iy. \\ \text{Sol.16} \quad \text{We have, } z = x + iy \\ \Rightarrow z - 1 = z = x + iy - 1 = (x - 1) + iy \\ \text{And } z + 3i = x + iy + 3i = x + i(y + 3) \\ \Rightarrow \arg(z - 1) = \tan \alpha = \frac{b}{a} = \frac{y}{x - 1} \\ \Rightarrow \arg(z + 3i) = \tan \alpha = \frac{b}{a} = \frac{y}{x - 1} \\ \Rightarrow \arg(z + 3i) = \tan \alpha = \frac{b}{a} = \frac{y}{x - 1} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow y = 3(x - 1) \\ \Rightarrow \frac{y}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow y = 3(x - 1) \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow y = 3(x - 1) \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow \frac{x^{-1}}{y} = \frac{1}{3} \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow xy = xy + 3x - y - 3 \\ \Rightarrow$$

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Q.18)	Evaluate: $i^n + i^{n+1} + i^{n+2} + i^{n+3}$	
Sol.18)	$i^n + i^n \cdot i + i^n \cdot i^2 + i^n i^3$	
	$=i^{n}(1+i+(i^{2}+i^{3}))$	
	$=i^n(1+i-1-i)$	
	$=i^n=0$	
	= 0 ans.	

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