ALWAYS BELIEVE IN YOURSELF

Class 11th

Complex Numbers

Lecture 4

CHAPTER OVERVIEW

प्रारंभ BATCH

Next Toppers

MONDAY

[R & F
TRIGNO]

Square Root

INTRODUCTION

CONCEPT OF IOTA

COMPLEX NUMBER

EQUALITY OF COMPLEX NUMBER

OPERATION ON COMPLEX NUMBER

CONJUGATE AND MODULES.

ARGAND PLANE AND POLAR REPRESENTATION

MISCELLANEOUS PROBLEMS

Find real theta such that $\dfrac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

$\boxed{\sin 0^\circ = 0}$

$\text{Im}(z) = 0$

$\rightarrow \dfrac{3+2i\sin\theta}{1-2i\sin\theta} \times \dfrac{1+2i\sin\theta}{1+2i\sin\theta}$

$\Rightarrow \dfrac{3+6i\sin\theta+2i\sin\theta+4i^2\sin^2\theta}{1^2-(2i\sin\theta)^2}$

$\Rightarrow \dfrac{3+8i\sin\theta-4\sin^2\theta}{1-4i^2\sin^2\theta}$

$1-(-4\sin^2\theta)$

$1+4\sin^2\theta$

$\Rightarrow \dfrac{3-4\sin^2\theta+8i\sin\theta}{1+4\sin^2\theta}$

$\Rightarrow \dfrac{3-4\sin^2\theta}{1+4\sin^2\theta}+\dfrac{8i\sin\theta}{1+4\sin^2\theta}$

$\dfrac{8i\sin\theta}{1+4\sin^2\theta}=0$

$\boxed{8i\sin\theta=0}$

$\sin\theta=0$

$\theta=n\pi,\ n\in\mathbb{Z}$

प्रारंभ BATCH

Next Toppers

If $x+iy=\sqrt{\frac{a+ib}{c+id}}$, prove that: $(x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$.

$$\overline{x+iy}=\overline{\sqrt{\frac{\overline{a+ib}}{\overline{c+id}}}}$$

$$\Rightarrow x-iy=\sqrt{\frac{a-ib}{c-id}}$$

$$\Rightarrow (x+iy)(x-iy)=\sqrt{\frac{a+ib}{c+id}}\times\sqrt{\frac{a-ib}{c-id}}$$

$$\Rightarrow x^2+y^2=\sqrt{\frac{a^2+b^2}{c^2+d^2}}$$

$$(x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$$

P K L

प्रारंभ BATCH

Next Toppers

$(1+i)^2$

Find the least positive value of n, if $\left(\frac{1+i}{1-i}\right)^n = 1$.

$$\rightarrow \left(\frac{1+i}{1-i} \times \frac{1+i}{1+i}\right)^n = 1$$

$$\Rightarrow \left[\frac{(1+i)^2}{1^2 - i^2}\right]^n = 1$$

$$\Rightarrow \left[\frac{1 + i^2 + 2i}{1 - (-1)}\right]^n = 1$$

$$\left[\frac{\cancel{1} - \cancel{1} + 2i}{1+1}\right]^n = 1$$

$$\left(\frac{\cancel{2}i}{\cancel{2}}\right)^n = 1$$

$$i^n = 1$$

$$\boxed{n = 4}$$

$i^0 = 1$

$i^1 = \sqrt{-1}$

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$

$i^5 = i = \sqrt{-1}$

$i^6 = -1$

$i^7 = -i$

$i^8 = 1$

प्रारंभ BATCH

Next Toppers

If $a + ib = \dfrac{c+i}{c-i}$, where c is real, prove that: $a^2 + b^2 = 1$ and $\boxed{\dfrac{b}{a} = \dfrac{2c}{c^2-1}}$.

$$\overline{a+ib} = \frac{\overline{c+i}}{\overline{c-i}}$$

$$a-ib = \frac{c-i}{c+i}$$

$$(a+ib)(a-ib) = \left[\frac{\cancel{c+i}}{\cancel{c-i}}\right]\left[\frac{\cancel{c-i}}{\cancel{c+i}}\right]$$

$$a^2+b^2 = 1$$

$$a+ib = \frac{c+i}{c-i} \times \frac{c+i}{c+i}$$

$$a+ib = \frac{(c+i)^2}{c^2-(i)^2}$$

$$a+ib : \frac{c^2+i^2+2ci}{c^2-(-1)}$$

$$a+ib : \frac{c^2-1+2ci}{c^2+1}$$

$x \times x : x^2$

$$a+ib = \frac{c^2-1}{c^2+1} + \frac{2ci}{c^2+1}$$

$$a = \frac{c^2-1}{c^2+1}, \quad b : \frac{2c}{c^2+1}$$

$$\frac{b}{a} = \frac{\dfrac{2c}{\cancel{c^2+1}}}{\dfrac{c^2-1}{\cancel{c^2+1}}} = \frac{2c}{c^2-1}$$

प्रारंभ BATCH

Next Toppers

If $(x + iy)^{1/3} = a + ib$, $x, y, ab \in R$. Show that

(i) $\frac{x}{a} + \frac{y}{b} = 4\left(a^2 - b^2\right)$ (ii) $\frac{x}{a} - \frac{y}{b} = -2\left(a^2 + b^2\right)$

$(a^2-3b^2) - (3a^2-b^2)$

$\Rightarrow a^2-3b^2-3a^2+b^2 = -2a^2-2b^2$

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

$\left[(x+iy)^{\frac{1}{3}}\right]^{3} = (a+ib)^3$

$x+iy = a^3+(ib)^3+3a\times ib(a+ib)$

$\Rightarrow a^3+i^3b^3+3a^2ib+3ai^2b^2$

$\Rightarrow a^3-ib^3+3a^2bi-3ab^2$

$\Rightarrow a^3-3ab^2+3a^2bi-ib^3$

$x = a^3-3ab^2$

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

$\frac{x}{a} = a^2-3b^2$

$y = 3a^2b-b^3$

$y = b(3a^2-b^2)$

$\frac{y}{b} = 3a^2-b^2$

$\frac{x}{a}+\frac{y}{b} = a^2-3b^2+3a^2-b^2$

$= 4a^2-4b^2$

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

If $\dfrac{a+ib}{c+id} = x+iy$, prove that $\dfrac{a-ib}{c-id} = x-iy$ and $\dfrac{a^2+b^2}{c^2+d^2} = x^2+y^2$.

If $(\overline{a+ib})(\overline{c+id})(\overline{e+if})(\overline{g+ih}) = \overline{A+iB}$ prove that
$(a^2+b^2)(c^2+d^2)(e^2+f^2)(g^2+h^2) = A^2+B^2$

* $A+iB = (a+ib)(c+id)(e+if)(g+ih)$

$A-iB = (a-ib)(c-id)(e-if)(g-ih)$

$(A+iB)(A-iB) = \underline{(a+ib)(a-ib)}\,\underline{(c+id)(c-id)}(e+if)(e-if)(g+ih)(g-ih)$

$A^2+B^2 = (a^2+b^2)(c^2+d^2)(e^2+f^2)(g^2+h^2)$

If α and β are different complex numbers with |β|=1, find $\left|\dfrac{\beta-\alpha}{1-\overline{\alpha}\beta}\right|$.

$\alpha \cdot \bar{\alpha} = |\alpha|^2$

प्रारंभ BATCH

Next Toppers

$\boxed{x \neq 0}$

Find non-zero integral solutions of $|1 - i|^x = 2^x$.

$x = 1$

$y = -1$

$|1 - i|^x = 2^x$

$\left[\sqrt{1^2 + (-1)^2}\right]^x = 2^x$

$\left(\sqrt{1+1}\right)^x = 2^x$

$(\sqrt{2})^x = 2^x$

$\left[(2)^{\frac{1}{2}}\right]^x = 2^x$

$2^{x/2} = 2^x$

$\frac{x}{2} = x$

$x = 2x$

$0 = 2x - x$

$\boxed{0 = x}$ ✓

$1 + i(-1) = \underline{1 - i}$

$|x + iy|$

$\Rightarrow \sqrt{x^2 + y^2}$

Zero Non Integral Solⁿ

Thank you Coodiess !!

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Properties of Conjugate

→ $\overline{(\bar{z})} = z$

→ $\boxed{z + \bar{z} = 2\,Re(z)}$

→ $z - \bar{z} = 2i\,Im(z)$

→ $\overline{z_1 \pm z_2} = \bar{z}_1 \pm \bar{z}_2$

→ $\overline{z_1 \cdot z_2} = \bar{z}_1 \cdot \bar{z}_2$

→ $\overline{\left(\frac{z_1}{z_2}\right)} = \frac{\bar{z}_1}{\bar{z}_2}$

Properties of Modulus

→ $|z| = |\bar{z}| = |-z|$

→ $|z_1 \cdot z_2| = |z_1| \cdot |z_2|$

→ $\left|\frac{z_1}{z_2}\right| = \frac{|z_1|}{|z_2|}$

* $z \cdot \bar{z} = |z|^2$

→ $|z_1 + z_2|^2 = |z_1|^2 + |z_2|^2 + 2\,Re(z_1 \cdot \bar{z}_2)$

* → $|z_1 - z_2|^2 = |z_1|^2 + |z_2|^2 - 2\,Re(z_1 \cdot \bar{z}_2)$

$z = z_1 - z_2$

$z \cdot \bar{z} = |z|^2$

$|z_1 - z_2|^2$

$(z_1 - z_2)\overline{(z_1 - z_2)} = |z_1 - z_2|^2$

$(z_1 - z_2)\overline{(z_1 - z_2)} = |z_1 - z_2|^2$

$\overline{z_1 - z_2} = \bar{z}_1 - \bar{z}_2$

$(z_1 - z_2)(\bar{z}_1 - \bar{z}_2)$

$z_1 \cdot \bar{z}_1 - z_1 \cdot \bar{z}_2 - z_2 \cdot \bar{z}_1 + z_2 \cdot \bar{z}_2$

$\overline{(z_1 \cdot \bar{z}_2)} = \bar{z}_1 \cdot \bar{\bar{z}}_2$

$= \bar{z}_1 \cdot z_2$

$|z_1|^2 + |z_2|^2 - z_1 \cdot \bar{z}_2 - z_2 \cdot \bar{z}_1$

$|z_1|^2 + |z_2|^2 - z_1 \cdot \bar{z}_2 - \overline{z_1 \cdot \bar{z}_2}$

$z + \bar{z} = 2\,\mathrm{Re}(z)$

$|z_1|^2 + |z_2|^2 - (z_1 \cdot \bar{z}_2 + \overline{z_1 \cdot \bar{z}_2})$

$(z_1 + \bar{z}_2) + \overline{(z_1 + \bar{z}_2)} = 2\,\mathrm{Re}(z_1 + \bar{z}_2)$

$|z_1|^2 + |z_2|^2 - 2\,\mathrm{Re}(z_1 \cdot \bar{z}_2)$

$$z+\bar{z}$$

$$\exists \quad z = \underbrace{x}_{\mathrm{Re}(z)} + i\underbrace{y}_{\mathrm{Im}(z)}$$

$$\bar{z} = x - iy$$

$$z+\bar{z} = x + \cancel{iy} + x - \cancel{iy}$$

$$= 2x$$

$$z+\bar{z} = 2\,\mathrm{Re}(z)$$

$$z-\bar{z}$$

$$(x+iy)-(x-iy)$$

$$\cancel{x}+iy-\cancel{x}+iy$$

$$2iy$$

$$2i\,\mathrm{Im}(z)$$

$z_1 + z_2 = z$

$|z_1 + z_2|^2 \longrightarrow$ Comp.

$\overline{z_1 + z_2} = \bar{z}_1 + \bar{z}_2$

$|z| = \sqrt{x + iy}$

$z + \bar{z} = 2\,\mathrm{Re}(z)$

$(z_1 + \bar{z}_2) + \overline{(z_1 + \bar{z}_2)} = 2\,\mathrm{Re}(z_1 + \bar{z}_2)$

$(z_1 + z_2)\,\overline{(z_1 + z_2)} = |z_1 + z_2|^2$

$z \qquad \bar{z}$

$= |z|^2$

$(z_1 + z_2)(\bar{z}_1 + \bar{z}_2)$

$z_1 \cdot \bar{z}_1 + z_1 \cdot \bar{z}_2 + z_2 \cdot \bar{z}_1 + z_2 \cdot \bar{z}_2$

$|z_1|^2 + |z_2|^2 + z_1 \cdot \bar{z}_2 + z_2 \cdot \bar{z}_1$

$|z_1|^2 + |z_2|^2 + z_1 \cdot \bar{z}_2 + \overline{z_1 \cdot \bar{z}_2}$

$|z_1|^2 + |z_2|^2 + 2\,\mathrm{Re}(z_1 \cdot \bar{z}_2)$

$\overline{z_1 \cdot \bar{z}_2}$

$\Rightarrow \bar{z}_1 \cdot \bar{\bar{z}}_2$

$\Rightarrow \bar{z}_1 \cdot z_2$

$|z|^2 = z \cdot \bar{z}$

$z = x + iy$

$\bar{z} = x - iy$

$z \cdot \bar{z} = (x + iy)(x - iy)$

$= x^2 - (iy)^2$

$= x^2 - i^2 y^2 = x^2 + y^2$

$= |z|^2$

Find real theta such that $\dfrac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

If $x + iy = \sqrt{\dfrac{a+ib}{c+id}}$**, prove that:** $(x^2 + y^2)^2 = \dfrac{a^2 + b^2}{c^2 + d^2}$.

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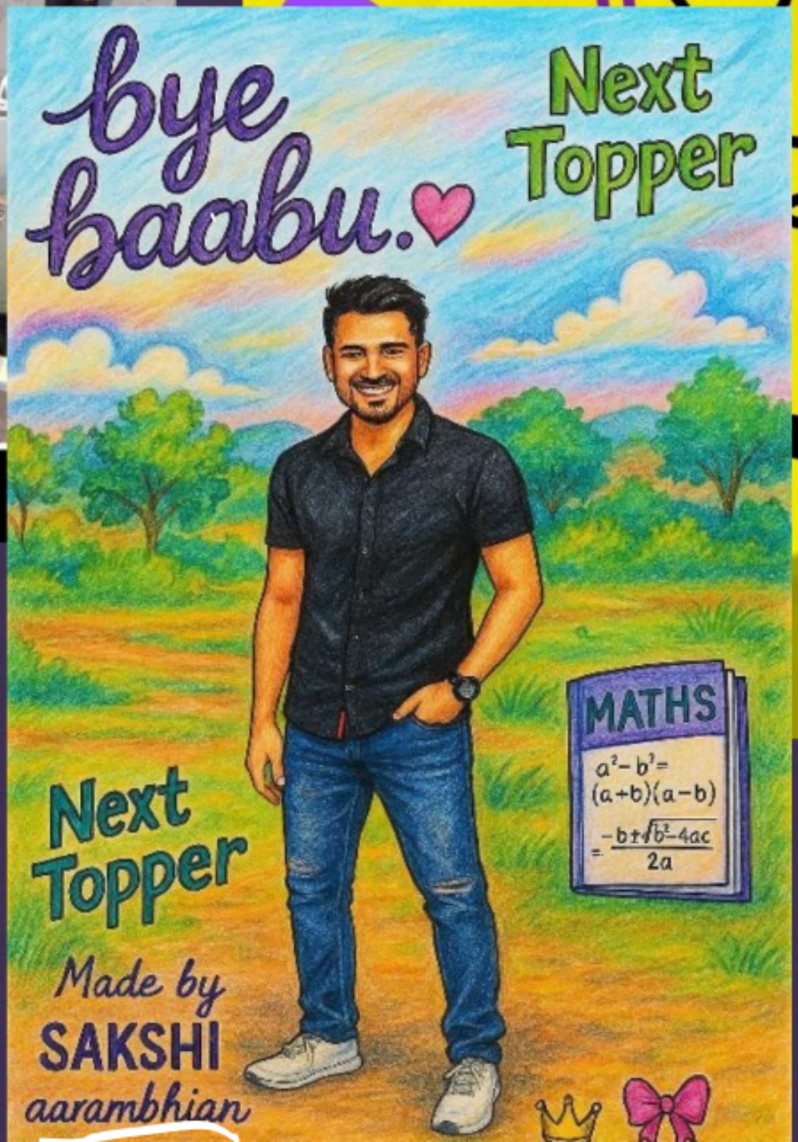
If $(a+ib)(c+id)(e+if)(g+ih) = A+iB$ prove that

$$(a^2+b^2)(c^2+d^2)(e^2+f^2)(g^2+h^2) = A^2+B^2$$


Thanku so much pookies
Always belive your
Nisha


THANK YOU


bye baabu.
Next Topper
MATHS
$a^2-b^2=$
$(a+b)(a-b)$
$=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
Next Topper
Made by
SAKSHI
aarambhian


MADE BY DIKSHA
KULLU BHAI
ALWAYS
BELIEVE
IN YOUR SEL


BY:SWASTIKADWIVEDI
KAISA LGA?
KULLU BHAIYA KI CLASS ME....
MAJA AYA TO BOLO;
TARARARARA.....

Thank you Coodiess !!