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Where Minds Pollinate

Class 11
Mathematics

Chapter 1
Review Exercise 1
Notes

National Book Foundation

Ch#1 Review Exercise.

(i) $i^2 + i^4 + i^6 + \cdots + i^{100}$

Sol: $(i^2) + (i^2)^2 + (i^2)^3 + \cancel{(i^2)^4} \quad (i^2)^{50}$

$= \cancel{-1 + 1 - 1 + 1}$

$= \cancel{0} - \cancel{1} + \cancel{1} - \cancel{1} - \cdots + \cancel{1}$

$= 0$

(ii) $\left|\dfrac{(3-2i)(1+i)}{2-3i}\right|$

Sol: $\cancel{\left|\dfrac{3+3i-2i+2}{2-3i}\right|}$

$\cancel{= \left|\dfrac{5+i}{2-3i}\right|}$

$\cancel{= \dfrac{\sqrt{5^2+(i)^2}}{\sqrt{2^2+(-3i)^2}} = \dfrac{\sqrt{25-1}}{\sqrt{4-9}} = \dfrac{\sqrt{24}}{\sqrt{-5}}}$

Sol: $\left|\dfrac{3+3i-2i-2i^2}{2-3i}\right|$

$\left|\dfrac{5+i}{2-3i}\right| = \left(\dfrac{5+i}{2-3i} \times \dfrac{2+3i}{2+3i}\right)$

$= \left|\dfrac{10+15i+2i-3}{2^2-(3i)^2}\right| \qquad \left|\dfrac{7}{13} + \dfrac{17}{13}i\right|$

$= \left|\dfrac{7+17i}{4+9}\right| \qquad \sqrt{\left(\dfrac{7}{13}\right)^2 + \left(\dfrac{17}{13}\right)^2}$

$= \left|\dfrac{7+17i}{13}\right| \qquad = \sqrt{2}$ Ans

$(5i)^2$

$25i^2$

(iii) $|\overline{(3-2i)(4-i)}|$

Sol:- $|12-3i-8i-2|$

$= |\overline{10-11i}|$

$= |10+11i|$

$= \sqrt{10^2+11^2}$

$= \sqrt{100+121}$

$= \sqrt{221}$

(iv) $\left(\dfrac{3+5i}{2-3i}\right)^{-1}$

$\left(\cancel{3+5i}\left(\dfrac{2-3i}{3+5i}\right)\right)$

$\left(\dfrac{2-3i}{3+5i} \times \dfrac{3-5i}{3-5i}\right)$

$\left(\dfrac{6-10i-9i-15}{9+25}\right)$

$\left|\dfrac{9-19i}{34}\right|$

Q3) $3x^2+108$

Sol:- $3(x^2+36)$

$3(x^2-i^2(6)^2$

$3(x^2-(6i)^2$

$3(x+6i)(x-6i)$

(ii) $4x^2+40$

$4(x^2+10)$

$4(x^2-i^2\sqrt{10}$

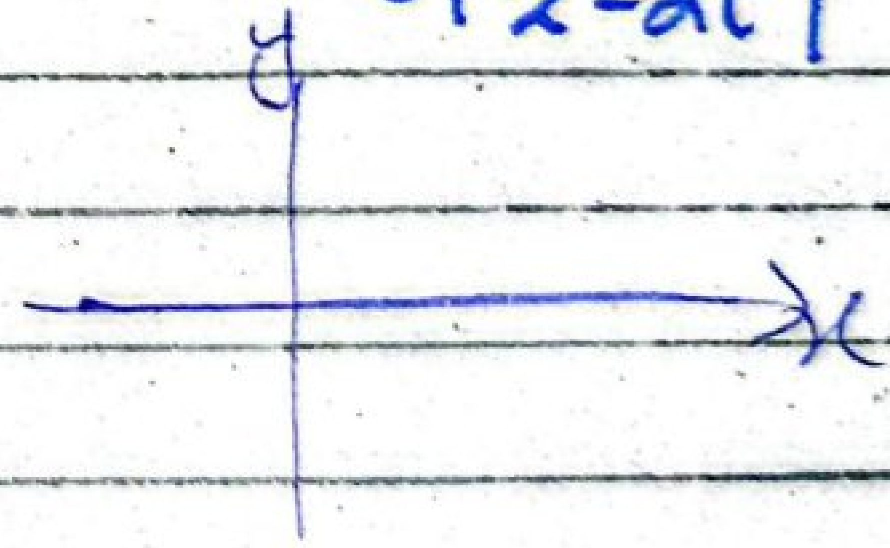
$4(x^2-(\sqrt{10}i)^2$

$4(x-\sqrt{10}i)(x+\sqrt{10}i)$

Q4) $z=x+iy$ on complex plane if $\left|\dfrac{z+2i}{z-2i}\right|=1$

$\left|\dfrac{x+yi+2i}{x+yi-2i}\right| = 1$

$\left|\dfrac{x+i(y+2)}{x+i(y-2)}\right| = 1$



$\sqrt{x^2+(y+2)^2} = \sqrt{x^2+(y-2)^2}$

$\left(\sqrt{x^2+y^2+4+4y}\right)^2 = \left(\sqrt{x^2+y^2+4-4y}\right)^2$

$\cancel{x^2}+\cancel{y^2}+4+4y = \cancel{x^2}+\cancel{y^2}+4-4y$

$8y = 0$

$\boxed{y=0}$

there for

$z = x+yi$

$\boxed{z=x}$

(5) Find z when $(z-3i)(z+5i) = 3-4i$.

$(x+yi-3i)(x+yi+5i) = 3-4i$.

$\cancel{(x+i(y-3))}$

$\cancel{x^2 + xyi + 5xi + xyi + y^2i^2 + 5yi^2 - 3xi}$

$(x+yi-3i)(2+5i) = 3-4i$

$2x + 5xi + 2yi + 5yi^2 - 6i - 15i^2 = 3-4i$.

$2x + 5xi + 2yi - 5y - 6i + 15 = 3-4i$.

$(2x-5y+15) + (5x+2y-6)i = 3-4i$

$2x+5y+15 = 3$; $5x+2y-6 = -4$

$5x+2y-6 = -4$ $5x+2y = 2$

$\times 5$ $\times 2$

$10x-25y = -6$ $10x+4y = 4$

$10x - \cancel{25y}\, y = -60$

$\pm 10x + 4y = \pm 4$

$-29y = -64$

$\boxed{y = 64/29}$

$2x - 5(64/29) = -12$

$2x = -12 + \frac{320}{29}$

$\cancel{2x}\; x = -14/29$

$z = -\frac{14}{29} + \frac{64}{29}i$

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$\sqrt{(5i)^2}$ $\sqrt{-5^2}$

$5i$ -5 $5i$

i^2 i

-1

⑥ $\left[\frac{1}{i^{10}} + (2-i)^2 + \sqrt{-25}\right]^3$

$\left[\frac{1}{(i^2)^5} + 4 + i^2 - 4i + 5i\right]^3$

$\left[\frac{1}{(-1)^5} + 4 - 1 - 4i + 5i\right]^3$

$\left[-1 + 4 - 1 - 4i + 5i\right]^3$

$(2+i)^3$

$2^3 + i^3 + 3(2)(i)(2+i)$

$8 - i + 6i(2+i)$

$8 - i + 12i - 6$

$2 + 11i$ Ans

⑦ $2x^2 - 11x + 16 = 0$

$x^2 - \frac{11}{2}x + 8 = 0$

$x^2 - \frac{11}{2}x = -8$

$x^2 - \frac{11}{2}x + \left(\frac{11}{4}\right)^2 = -8 + \left(\frac{11}{4}\right)^2$

$\left(x - \frac{11}{4}\right)^2 = -8 + \frac{121}{16}$

$\sqrt{\left(x - \frac{11}{4}\right)^2} = \sqrt{\frac{-128+121}{16}}$

$x - \frac{11}{4} = \pm\sqrt{-\frac{7}{16}}$

$x - \frac{11}{4} = \pm\frac{\sqrt{7}\,i}{4}$

$\boxed{x = \frac{\pm\sqrt{7}\,i + 11}{4}}$ A

$-\frac{11}{2} \times \frac{1}{2}$ $\frac{11}{4}$

(8) $X_{max} = ?$

$X = \sqrt{2} + i\sqrt{2}$

$\theta = 45°$

$X = X_{max}\, e^{i\theta}$

$\sqrt{2} + i\sqrt{2} = x_{max}(\cos 45 + i\sin 45°)$

$\sqrt{2}(1+i) = x_{max}\left(\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}\right)$

$\cancel{\sqrt{2}(1+i}$

$\sqrt{2}(1+i) = x_{max}\left(\frac{1+i}{\sqrt{2}}\right)$

$\sqrt{2}(1+i) = x_{max}\, \frac{1}{\sqrt{2}}(1+i)$

$(\sqrt{2})^2(1+i) = x_{max}(1+i)$

$2(\cancel{1+i}) = x_{max}(\cancel{1+i})$

$$\boxed{X_{max} = 2}$$