

JEE MATHS

complex number

15TH AUGUST 2025

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$$i^{57} + \frac{1}{i^{125}} =$$

1) 0

2) $2i$

3) $-2i$

4) 2

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The value of $i^n + i^{n+1} + i^{n+2} + i^{n+3} =$

1) 1

2) - 1

3) 0

4) - 2

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$$\left(\frac{1+i}{1-i}\right)^{4n+1} =$$

1) i

2) - i

3) 1

4) - 1

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If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = A + iB$ then A,B are

1) 0, 2

2) 0, -2

3) 2, 0

4) -2, 0

Solution:

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The least positive integer n such that $\left(\frac{2i}{1+i}\right)^n$ is a positive integer is

1) 2

2) 4

3) 8

4) 16

Solution:

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The multiplicative inverse of $(4+3i)$ is

- 1) $\frac{4}{25} + i\frac{3}{25}$ 2) $\frac{4}{25} - i\frac{3}{25}$ 3) $-\frac{4}{25} - i\frac{3}{25}$ 4) $4 - 3i$

Solution:

$$\sqrt{-3}\sqrt{-75} =$$

1) 15

2) $15i$

3) -15

4) $-5i$

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If $(x + iy)^{1/3} = a + ib$ then $\frac{x}{a} + \frac{y}{b} =$

1) 1



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

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

4) $3(a^2 - b^2)$

Solution:

Cubing on both sides of given equation

$$x + iy = (a + ib)^3 = a^3 + 3a^2bi - 3ab^2 - ib^3$$

$$\Rightarrow x + iy = a(a^2 - 3b^2) + ib(3a^2 - b^2)$$

$$\Rightarrow \frac{x}{a} = a^2 - 3b^2, \quad \frac{y}{b} = 3a^2 - b^2$$

$$\therefore \frac{x}{a} + \frac{y}{b} = 4a^2 - 4b^2 = 4(a^2 - b^2)$$

If $u + iv = \frac{3i}{x+iy+2}$ then y in terms of u, v is

1) $\frac{6u}{u^2+v^2}$

2) $\frac{2u}{u^2-v^2}$

3) $\frac{3u}{u^2+v^2}$

4) $\frac{5u}{u^2-v^2}$

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The mod - amp form of $-1-\sqrt{3}i$ is

- 1) $\text{cis}\left(\frac{2\pi}{3}\right)$ 2) $2\text{cis}\left(-\frac{2\pi}{3}\right)$ 3) $\text{cis}\left(\frac{-2\pi}{3}\right)$ 4) $2\text{cis}\left(\frac{2\pi}{3}\right)$

Solution

The mod - amp form of $1 + \cos\theta + i \sin\theta$ is

1) $\cos\frac{\theta}{2} \operatorname{cis}\frac{\theta}{2}$

2) $2\cos\frac{\theta}{2} \operatorname{cis}\frac{\theta}{2}$

3) $3\cos\frac{\theta}{2} \operatorname{cis}\frac{\theta}{2}$

4) $4\cos\frac{\theta}{2} \operatorname{cis}\frac{\theta}{2}$

Solution

If $\frac{\pi}{2} < \alpha < \frac{3\pi}{2}$ then the mod - amp form of $(1 + \cos 2\alpha) + i \sin 2\alpha$ is

1) $-2\cos\alpha[\cos(\pi + \alpha) + i \sin(\pi + \alpha)]$

2) $2\cos\alpha[\cos\alpha + i \sin\alpha]$

3) $2\cos\alpha[\cos(-\alpha) + i \sin(-\alpha)]$

4) $-2\cos\alpha[\cos(\pi - \alpha) + i \sin(\pi - \alpha)]$

The principal value of argument of the complex numbers

$$\sin\frac{16\pi}{15} + i\left(1 + \cos\frac{16\pi}{15}\right) \text{ is}$$

1) $-\frac{\pi}{30}$

2) $-\frac{29\pi}{30}$

3) $\frac{8\pi}{15}$

4) $\frac{-8\pi}{15}$

If $(a_1+ib_1)(a_2+ib_2) \dots (a_n+ib_n) = A+iB$ then $\tan^{-1} \frac{b_1}{a_1} + \tan^{-1} \frac{b_2}{a_2} + \dots + \tan^{-1} \frac{b_n}{a_n} =$

1) $n\pi$

2) $n\pi + \tan^{-1} \frac{b_2}{a_2} + \dots + \tan^{-1} \frac{b_n}{a_n}$

3) $n\pi + \tan^{-1} \frac{B}{A}$

4) $\tan^{-1} \frac{B}{A}$

Solution

If α and β are real then $\left| \frac{\alpha+i\beta}{\beta+i\alpha} \right| =$

1) > 1

2) < 1

3) 1

4) lies between 0 and 1

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If z is nonzero complex number then $\frac{\bar{z}}{|z|^2} =$

1) $\frac{1}{\bar{z}}$

2) $\frac{1}{z}$

3) $-\frac{1}{z}$

4) $-\frac{1}{|z|}$

Solution:

$(Z - 1)(\bar{Z} - 1)$ can be written as

1) $Z\bar{Z} + 1$

2) $|Z - 1|^2$

3) $|Z|^2 + 1$

4) $|Z|^2 + 2$

If $x+iy = \sqrt{\frac{a+ib}{c+id}}$ then $(x^2+y^2)^2 =$

1) $\frac{a^2 + b^2}{c^2 + d^2}$

2) $\frac{a^2 + b^2}{c^2 - d^2}$

3) $\sqrt{\frac{a^2+b^2}{c^2+d^2}}$

4) None

If $(1-i)(1-2i)(1-3i) \dots (1-ni) = x-iy$ then $2.5.10 \dots (1+n^2)$

1) $x + y$

2) $x^2 + y^2$

3) $x^2 - y^2$

4) $x-y$

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$$\sqrt{8 - 6i} =$$

- 1) $\pm (5 - i)$ 2) $\pm (2 + i)$ 3) $\pm (3 - i)$ 4) $\pm (1 + i)$

$$21. \sqrt{x + i\sqrt{x^4 + x^2 + 1}} =$$

$$1) \pm \sqrt{x^2 + x - 1}$$

$$2) \pm \sqrt{x^2 + 2x + 1}$$

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

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

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$\sqrt{i} - \sqrt{-i}$ is equal to

1) $\sqrt{2}$

2) $\frac{1}{i\sqrt{2}}$

3) $\sqrt{-1}$

4) $i\sqrt{2}$

Solution

If the first term and common ratio of a G.P, are both $\frac{1}{2}(\sqrt{3} + i)$ then the absolute value of its n^{th} term is

1) $4n$



2) 1

3) 2^n

4) $3n$

Solution

Given $a = r = \frac{1}{2}(\sqrt{3} + i)$

$$t_n = ar^{n-1}$$

$$|t_n| = |ar^{n-1}| = |r \cdot r^{n-1}| = |r|^n$$

$$= \left| \left(\frac{\sqrt{3} + i}{2} \right)^n \right| = \left| \left(\frac{\sqrt{3} + i}{2} \right) \right|^n = 1$$

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