

Q1. JEE Main 2026 (21 January Shift 2)

Let z be the complex number satisfying $|z - 5| \leq 3$ and having maximum positive principal argument. Then $34 \left| \frac{5z-12}{5iz+16} \right|^2$ is equal to :

- (1) 26 (2) 12 (3) 20 (4) 16

Q2. JEE Main 2026 (23 January Shift 1)

Let $S = \{z : 3 \leq |2z - 3(1 + i)| \leq 7\}$ be a set of complex numbers. Then $\min_{z \in S} \left| z + \frac{1}{2}(5 + 3i) \right|$ is equal to :

- (1) 2 (2) $\frac{5}{2}$ (3) $\frac{3}{2}$ (4) $\frac{1}{2}$

Q3. JEE Main 2026 (28 January Shift 2)

Let $A = \{z \in \mathbb{C} : |z - 2| \leq 4\}$ and $B = \{z \in \mathbb{C} : |z - 2| + |z + 2| = 5\}$. Then the $\max \{|z_1 - z_2| : z_1 \in A \text{ and } z_2 \in B\}$ is :

- (1) $\frac{17}{2}$ (2) 8 (3) 9 (4) $\frac{15}{2}$

Q4. JEE Main 2026 (24 January Shift 2)

Let $z = (1 + i)(1 + 2i)(1 + 3i) \dots (1 + ni)$, where $i = \sqrt{-1}$. If $|z|^2 = 44200$, then n is equal to _____

Q5. JEE Main 2026 (22 January Shift 2)

Let $S = \{z \in \mathbb{C} : 4z^2 + \bar{z} = 0\}$. Then $\sum_{z \in S} |z|^2$ is equal to:

- (1) $\frac{5}{64}$ (2) $\frac{1}{16}$ (3) $\frac{3}{16}$ (4) $\frac{7}{64}$

Q6. JEE Main 2026 (22 January Shift 1)

Let $\alpha = \frac{-1+i\sqrt{3}}{2}$ and $\beta = \frac{-1-i\sqrt{3}}{2}$, $i = \sqrt{-1}$. If

$(7 - 7\alpha + 9\beta)^{20} + (9 + 7\alpha - 7\beta)^{20} + (-7 + 9\alpha + 7\beta)^{20} + (14 + 7\alpha + 7\beta)^{20} = m^{10}$, then m is _____

Q7. JEE Main 2026 (23 January Shift 2)

If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

- (1) 1 (2) 256 (3) -1 (4) 0

Q8. JEE Main 2026 (21 January Shift 1)

If $x^2 + x + 1 = 0$, then the value of $(x + \frac{1}{x})^4 + (x^2 + \frac{1}{x^2})^4 + (x^3 + \frac{1}{x^3})^4 + \dots + (x^{25} + \frac{1}{x^{25}})^4$ is:

- (1) 162 (2) 175 (3) 145 (4) 128

Q9. JEE Main 2026 (28 January Shift 1)

Let z be a complex number such that $|z - 6| = 5$ and $|z + 2 - 6i| = 5$. Then the value of $z^3 + 3z^2 - 15z + 141$ is equal to

(1) 50

(2) 61

(3) 37

(4) 42

ANSWERS AND SOLUTIONS

1. (3) 2. (3) 3. (1) 4. 5 5. (3) 6. 49 7. (2) 8. (3)

9. (1)

1. (3) The region $|z - 5| \leq 3$ is a disk centered at $(5, 0)$ with radius 3. Maximum positive principal argument from origin occurs at the tangent point from origin to the circle.

$$\sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5}$$

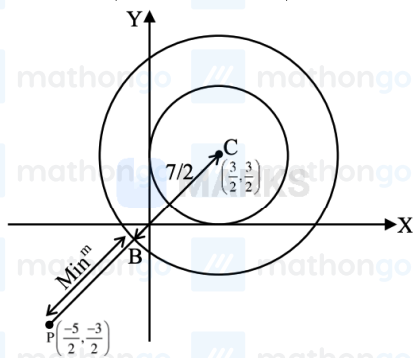
The tangent point is the foot of perpendicular from $(5, 0)$ to the line $3x - 4y = 0$, giving $z = \frac{16}{5} + \frac{12}{5}i$.

$$5z - 12 = 4 + 12i \Rightarrow |5z - 12|^2 = 160$$

$$5iz + 16 = 4 + 16i \Rightarrow |5iz + 16|^2 = 272$$

$$34 \left| \frac{5z-12}{5iz+16} \right|^2 = 34 \times \frac{160}{272} = 34 \times \frac{10}{17} = 20.$$

2. (3) $\frac{3}{2} \leq \left| z - \frac{3}{2}(1+i) \right| \leq \frac{7}{2}$



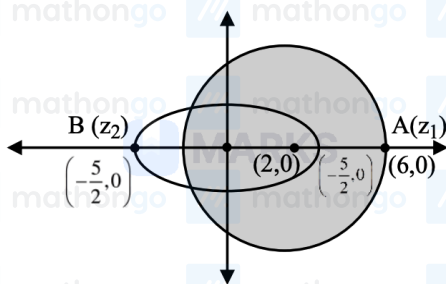
$$\min_{z \in S} \left| z - \left(\frac{-5}{2} - \frac{3}{2}i \right) \right| = PB$$

$$PB = PC - \frac{7}{2} \Rightarrow 5 - \frac{7}{2} \Rightarrow \frac{3}{2}$$

3. (1) $|z - 2| \leq 4 \Rightarrow (x - 2)^2 + y^2 \leq 16$

$$|z - 2| + |z + 2| = 5 \Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\Rightarrow \frac{4x^2}{25} + \frac{4y^2}{9} = 1$$



Maximum value of $|z_1 - z_2| = 6 + \frac{5}{2} = \frac{17}{2}$

4. (5) $z = (1+i)(1+2i)(1+3i)\cdots(1+ni)$ where $i = \sqrt{-1}$

$$|z|^2 = \prod_{k=1}^n |1+ki|^2 = \prod_{k=1}^n (1+k^2)$$

$$\text{Computing: } (1+1)(1+4)(1+9)(1+16)(1+25) = 2 \times 5 \times 10 \times 17 \times 26$$

$$= 10 \times 10 \times 17 \times 26 = 100 \times 442 = 44200$$

Therefore $n = 5$

5. (3) Let $z = x + iy$. From $4z^2 + \bar{z} = 0$, separating real and imaginary parts:

$$\text{Real: } 4x^2 - 4y^2 + x = 0, \text{ Imaginary: } y(8x - 1) = 0.$$

$$\text{Case 1: } y = 0$$

$$\Rightarrow x(4x + 1) = 0$$

$$\Rightarrow z = 0 \text{ or } z = -\frac{1}{4}.$$

$$\text{Case 2: } x = \frac{1}{8}$$

$$\Rightarrow \frac{1}{16} - 4y^2 + \frac{1}{8} = 0$$

$$\Rightarrow y^2 = \frac{3}{64}.$$

$$\text{So } |z|^2 = \frac{1}{64} + \frac{3}{64} = \frac{1}{16}.$$

$$\sum |z|^2 = 0 + \frac{1}{16} + \frac{1}{16} + \frac{1}{16} = \frac{3}{16}$$

6. (49) $\alpha = \omega, \beta = \omega^2$ (cube roots of unity).

$$\text{Let } z_1 = 7 - 7\omega + 9\omega^2, z_2 = 9 + 7\omega - 7\omega^2, z_3 = -7 + 9\omega + 7\omega^2.$$

$$\text{Calculating: } z_1 = 6 - 8i\sqrt{3}, z_2 = 9 + 7i\sqrt{3}, z_3 = -15 + i\sqrt{3}.$$

$$\text{All have } |z_k| = \sqrt{228}.$$

$$\text{Verify: } z_2 = z_1\omega, z_3 = z_1\omega^2.$$

$$z_1^{20} + z_2^{20} + z_3^{20} = z_1^{20}(1 + \omega^{20} + \omega^{40}) = z_1^{20}(1 + \omega^2 + \omega) = 0.$$

$$\text{Fourth term: } 14 + 7\omega + 7\omega^2 = 14 + 7(-1) = 7. \text{ So } 7^{20} = 49^{10}.$$

$$\text{Total} = 0 + 49^{10} = m^{10} \Rightarrow m = 49.$$

7. (2) $z = \frac{\sqrt{3}}{2} + \frac{i}{2} = e^{i\pi/6}.$

$$z^{201} = e^{i \cdot 201\pi/6} = e^{i \cdot 33.5\pi} = e^{i(33\pi + \pi/2)}.$$

$$\text{Since } e^{i \cdot 33\pi} = e^{i\pi} = -1, \text{ we get } z^{201} = -1 \cdot e^{i\pi/2} = -i.$$

$$z^{201} - i = -i - i = -2i.$$

$$(z^{201} - i)^8 = (-2i)^8 = 2^8 \cdot i^8 = 256 \cdot 1 = 256.$$

8. (3) Given $x^2 + x + 1 = 0$, so $x = \omega$ (primitive cube root of unity) with $x^3 = 1$.

$$\text{From the equation: } x + \frac{1}{x} = -1.$$

$$\text{Since } x^3 = 1, \text{ value of } x^n + x^{-n} \text{ has period 3:}$$

$$n \equiv 0 \pmod{3}: x^n + x^{-n} = 2$$

$$n \equiv 1, 2 \pmod{3}: x^n + x^{-n} = -1$$

$$\text{Fourth powers: } (2)^4 = 16, (-1)^4 = 1.$$

$$\text{For } n = 1 \text{ to } 25: 8 \text{ multiples of 3 contribute } 8 \times 16 = 128, \text{ remaining 17 terms contribute } 17 \times 1 = 17.$$

$$\text{Total} = 128 + 17 = 145.$$

9. (1) From $|z - 6| = 5$, point z lies on circle centered at $(6, 0)$ with radius 5.

From $|z + 2 - 6i| = 5$, point lies on circle centered at $(-2, 6)$ with radius 5.

Let $z = x + iy$.

First condition gives: $x^2 + y^2 = 12x - 11$.

Second gives: $x^2 + y^2 = -4x + 12y - 15$.

Setting equal: $16x - 12y + 4 = 0$, so $x = \frac{3y-1}{4}$.

Substituting into $(x - 6)^2 + y^2 = 25$: $(3y - 25)^2 + 16y^2 = 400$, which simplifies to $25y^2 - 150y + 225 = 0$,

giving $y = 3$ and $x = 2$.

Thus $z = 2 + 3i$, so $z^2 = -5 + 12i$ and $z^3 = -46 + 9i$.

$z^3 + 3z^2 - 15z + 141 = (-46 + 9i) + 3(-5 + 12i) - 15(2 + 3i) + 141 = 50$