One Two academy | Complex Numbers

Maximum Mark: 25 **Mathematics** **Time: 50 minutes**

Choose the correct answer: **3 x 1 = 3**

1. The principal argument of $(\sin 40^o + i \cos 40^o)^5$ is

(a) -110^o (b) -70° (c) 70° (d) 110°

2. The product of all four values of $\left(\cos\frac{\pi}{3} + i \sin\frac{\pi}{3}\right)^{\frac{3}{4}}$.

(a) -2 (b) -1 (c) 1 (d) 2

3. If z = $\frac{1}{1-\cos\theta - i\sin\theta}$, then Re(z) is

(a) 0 (b) $\frac{1}{2}$ (c) $\cot\frac{\theta}{2}$ (d) $\frac{1}{2}\cot\frac{\theta}{2}$

Answer the following: **3 x 2 = 6**

4. Which one of the points 10-8i, 11+ 6i is closest to 1+i.

5. If z = 2 – 2i, find the rotation of z by $\frac{3\pi}{2}$ radians in the counter clockwise direction about the origin.

6. Find the square root of 4 + 3i.

Answer any two of the following: **2 x 3 = 6**

7. Write in polar form of the following complex number

$$\frac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$$

8. Prove that $\arg(z_1 z_2) = \arg(z_1) + \arg(z_2)$.

9. Show that $\left(2 + i\sqrt{3}\right)^{10} - (2 - i\sqrt{3})^{10}$ is purely imaginary.

Answer the following: **2 x 5 = 10**

10. State and prove triangle inequality.

11. Suppose z_1, z_2 and z_3 are vertices of an equilateral triangle inscribed in the circle |z| = 2. If $z_1 = 1 + i\sqrt{3}$ then find z_2 and z_3.

OR

Solve the equation $z^3 + 27 = 0$.

All the Best

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Answer Key attached in the next page !!!

This page is to prevent seeing answer key

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Answer Key

Q.no	Solution	Marks
1.	(a) -110^o	**1**
2.	(c) 1	**1**
3.	(b) $\frac{1}{2}$	**1**
4.	AC = $\sqrt{162}$ BC = $\sqrt{125}$ B is closest to C 11 + 6i is closest to 1+i	**2**
5.	$\mathbf{2\sqrt{2}\ e^{i\frac{5\pi}{4}}}$	**2**
6.	$\pm\left(\frac{3}{\sqrt{2}}+i\frac{1}{\sqrt{2}}\right)$	**2**
7.	$\mathbf{\sqrt{2}\ cis\ \left(2k\pi+5\frac{\pi}{12}\right), k\in Z}$	**3**
8.	Correct proof	**3**
9.	Correct proof	**3**
10.	Correct proof	**5**
11.	**-2, 1-i$\sqrt{3}$**	**5**
	OR	**5**
	$\mathbf{3\ cis\frac{\pi}{3}, -3,\ 3\ cis\ 5\frac{\pi}{3}}$	

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