

MIDTERM RE -TEST (TERM 2 A.Y. 2024)

I. Multiple – Choice (35 items)

1. Which of the following statements is/are true?

- i. The modulus of any complex number $z = x + iy$ is obtained by $\sqrt{x^2 - y^2}$.
- ii. If $z = a + bi$, then its conjugate $\bar{z}$ is written as $-a - bi$.
- iii. $\sqrt{-1} = -i$
- iv. A complex point $z = -i$ is located in the imaginary axis of an argand diagram.

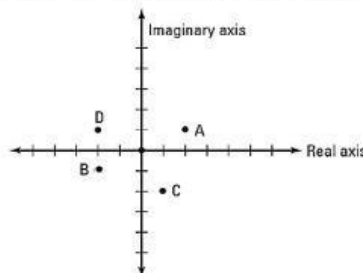
- a. statements iii and iv
- b. statements i, ii, iii
- c. statement iv only
- d. statement i only

2. What is the real part of the complex number: $\frac{a+ib}{a-ib}$, when written in its simplest form?

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

3. Which point in the Argand plane below shows the complex number $z = 1 - 2i$?

- a. pt. A
- b. pt. B
- c. pt. C
- d. pt. D



4. Given $z = -5$ is a complex point plotted on which part of the Argand plane?

- a. Quadrant II
- b. real axis
- c. imaginary axis
- d. Quadrant III

5. Which of the following is the simplest form of $\frac{5+2i}{-i}$?

- a. $-5 - 21$
- b. $\frac{3}{2} - \frac{i}{2}$
- c. $-2 + 5i$
- d. $-2 - 5i$

6. Given a complex number $z = \frac{-3\sqrt{3}}{2} - \frac{3}{2}i$, what is its argument θ that satisfies $-\pi < \theta \leq \pi$?

- a. $\frac{7\pi}{6}$
- b. $\frac{5\pi}{6}$
- c. $\frac{\pi}{6}$
- d. $\frac{-5\pi}{6}$

7. Which of the following statements is true, when the argument θ is in Quadrant II?

- a. $\arg \theta = -\theta$
- b. $\arg \theta = 180^\circ - \alpha$
- c. $\arg \theta = \theta$
- d. $\arg \theta = \alpha - 180^\circ$

8. If $z = -8\text{cis}-240^\circ$, what is its modulus?

- a. -8
- b. 8
- c. -240°
- d. 120°

For items 9 – 12.

Given $z_1 = 3 - 2i$, $z_2 = 2 + 5i$, $z_3 = 1 - 4i$

9. What is the value of $\overline{z_1 + z_2}$?

- a. $5 - 3i$
- b. $5 + 3i$
- c. $1 - 7i$
- d. $-1 + 7i$

10. What is the value of $\overline{\left(\frac{z_2}{z_3}\right)}$?

- a. $-\frac{18}{17} + \frac{13}{17}i$
- b. $\frac{18}{17} - \frac{13}{17}i$
- c. $-\frac{18}{17} - \frac{13}{17}i$
- d. $\frac{18}{17} + \frac{13}{17}i$

11. What is the approximate value of $\text{Arg}(\overline{z_1 z_2})$?

- a. 35°
- b. -35°
- c. 145°
- d. 215°

12. What is the value of $|\overline{z_1 z_2}|$?

- a. $\sqrt{17}$
- b. $3\sqrt{7}$
- c. $\sqrt{377}$
- d. $11\sqrt{7}$

13. Given: $z = \frac{1-2i}{-4i}$, what is the value of $\text{Re}(z)$ in simplest form?

- a. $\frac{-1}{2}$
- b. $\frac{1}{2}$
- c. $\frac{-1}{4}$
- d. $\frac{1}{4}$

For items 14 – 15, refer to the given complex below:

Given : $z = 2 - 3i$, find the value of the following:

14. What is the value of $|z - i|^2$?

- a. 16
- b. 4
- c. 20
- d. $\sqrt{20}$

15. What is the modulus of z^{-1} ?

- a. 13
- b. $\sqrt{13}$
- c. $\frac{1}{13}$
- d. $\frac{\sqrt{13}}{13}$

16. What is the imaginary part of the complex number: $(4\sqrt{3} - 4i)^3$?

- a. 0 b. 512 c. -512 d. $2\sqrt{5}$

17. Given the $r = 12$ and $\arg Z = \frac{2\pi}{3}$, and $z = a + bi$, what are the real values of a and b ?

- a. $a = 3, b = -2\sqrt{3}$ b. $a = -6, b = -6\sqrt{3}$
c. $a = -6\sqrt{3}, b = 6$ d. $a = -6, b = 6\sqrt{3}$

18. Which of the following is the rectangular form of $-2\sqrt{2} \operatorname{cis} \left(\frac{-\pi}{4} \right)$?

- a. $2 - 2i$ b. $-2 + \sqrt{2}i$ c. $-2 + 2i$ d. $2 - \sqrt{2}i$

19. Given $z = 9 - 9\sqrt{3}i$, what is the value of $|z^2|$?

- a. $18\sqrt{3}$ b. 324 c. 54 d. $\sqrt{324}$

For items 20 -22, refer to the polar graph below.

20. Which point represents $(-4, -30^\circ)$?

- a. P6 b. P1
c. P2 d. P4

21. Which of the following pair of coordinates is true about point P5?

- a. $(5, -90^\circ)$ b. $(-5, 90^\circ)$
c. $(-5, -270^\circ)$ d. all of the above

22. What are the coordinates of point P6?

- a. $(2, -330^\circ)$ b. $(2, 30^\circ)$
c. $(-2, -150^\circ)$ d. $(-2, -210^\circ)$

23. Given a polar coordinate $(-8, \frac{-2\pi}{3})$, what is the value of r ?

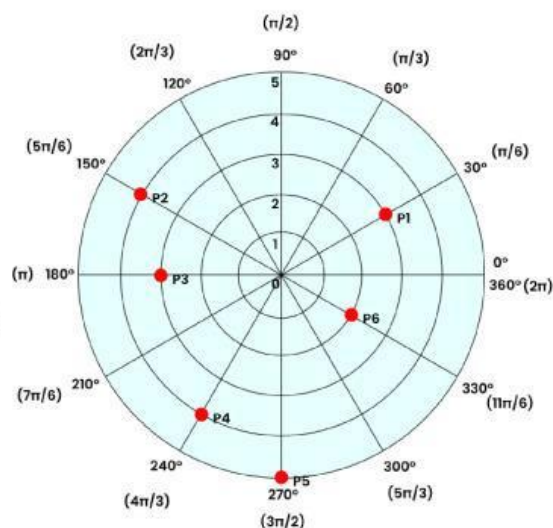
- a. -8 b. 8 c. $\frac{5\pi}{3}$ d. 300°

For items 24 - 27, refer to the given complex numbers below:

$$z_1 = 10 \operatorname{cis} \left(\frac{5\pi}{3} \right), z_2 = 3e^{\frac{7\pi}{6}i}, z_3 = 4 + 4i$$

24. What is the polar form of complex number Z_3 ?

- a. $4 \operatorname{cis} \frac{-\pi}{3}$ b. $4\sqrt{2} \operatorname{cis} \frac{\pi}{4}$ c. $8 \operatorname{cis} 45^\circ$ d. $4\sqrt{2} \operatorname{cis} \frac{-\pi}{4}$



25. What is the value of $Z_1 Z_3$ in polar form?

- a. $40(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12})$
- b. $40\sqrt{2}(\cos \frac{-\pi}{12} + i \sin \frac{-\pi}{12})$
- c. $40\sqrt{2}(\cos \frac{-23\pi}{12} + i \sin \frac{-23\pi}{12})$
- d. $40 + 10\sqrt{2}(\cos \frac{23\pi}{12} + i \sin \frac{23\pi}{12})$

26. What is the value of $\frac{Z_2}{Z_3}$ in polar form?

- a. $\frac{3}{4} \text{cis } \frac{11\pi}{12}$
- b. $\frac{3}{4\sqrt{2}} \text{cis } \frac{23\pi}{12}$
- c. $\frac{3\sqrt{2}}{8} \text{cis } \frac{11\pi}{12}$
- d. $\frac{4}{3} \text{cis } \frac{23\pi}{12}$

27. What is the equivalent exponential complex form of z_3 ?

- a. $4e^{\frac{-\pi}{3}i}$
- b. $4\sqrt{2}e^{\frac{\pi}{4}i}$
- c. $8e^{450i}$
- d. $4\sqrt{2}e^{\frac{-\pi}{4}i}$

28. Which of the following is the rectangular form of $z = 36e^{\frac{7\pi}{6}i}$?

- a. $-18 - 18\sqrt{3}i$
- b. $-18\sqrt{3} - 18i$
- c. $18\sqrt{3} + 18i$
- d. $18\sqrt{3} - 18i$

For items 29 – 30, refer to the given below:

Given $z = \frac{\sqrt{3}}{2} + \frac{1}{2}i$, find the value of the following:

29. What is the exact value of complex Z in polar form?

- a. $1\angle 30^\circ$
- b. $\text{cis } -30^\circ$
- c. $\cos 330^\circ + i \sin 330^\circ$
- d. $e^{\frac{\pi}{6}i}$

30. What is the exact value of z^9 in rectangular form?

- a. i
- b. $-i$
- c. 1
- d. -1

31. What is the simplest rectangular form of $(\cos 10^\circ - i \sin 10^\circ)^{-6}$?

- a. $\frac{1}{2} - \frac{\sqrt{3}}{2}i$
- b. $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$
- c. $\frac{\sqrt{3}}{2} - \frac{1}{2}i$
- d. $\frac{1}{2} + \frac{\sqrt{3}}{2}i$

32. Given $z = 2(\cos 12^\circ - i \sin 12^\circ)$, what is the value of z^{10} ?

- a. $512 - 512\sqrt{3}i$
- b. $-512 + 512\sqrt{3}i$
- c. $-512 - 512\sqrt{3}i$
- d. $512\sqrt{3} - 512i$

For items 33 – 35, refer to the given below:

$$\text{Given : } |z| = 2, \text{Arg}(z) = \frac{5\pi}{6} \quad |w| = 8, \text{Arg}(w) = \frac{3\pi}{2}$$

Find the following:

33. What is the value of z^2w ?

a. $16 - 16\sqrt{3}i$

b. $-16\sqrt{3} - 16i$

c. $16\sqrt{3} - 16i$

d. $16\sqrt{3} + 16i$

34. What is the value of $\frac{z}{w}$ in polar form?

a. $\frac{-1}{8} + \frac{\sqrt{3}}{8}i$

b. $\frac{\sqrt{3}}{8} - \frac{1}{8}i$

c. $\frac{-1}{8} - \frac{\sqrt{3}}{8}i$

d. $\frac{1}{8} - \frac{\sqrt{3}}{8}i$

35. What is the exponential form of $\frac{z}{w}$?

a. $\frac{1}{4}e^{-120^\circ i}$

b. $\frac{1}{4}e^{60^\circ i}$

c. $\frac{1}{8}e^{120^\circ i}$

d. $\frac{1}{4}e^{-240^\circ i}$

