

Matrix theory

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- 6) If $z = x + iy$ and $\omega = (1 - iz)/(z - i)$, then $|\omega| = 1$ implies that, in the complex plane
(1983 - 1 Mark)
- z lies on the imaginary axis
 - z lies on the real axis
 - z lies on unit circle
 - None of these
- 7) The points z_1, z_2, z_3, z_4 in the complex plane are the vertices of a parallelogram taken in order if and only if
(1983 - 1 Mark)
- $z_1 + z_4 = z_2 + z_3$
 - $z_1 + z_3 = z_2 + z_4$
 - $z_1 + z_2 = z_3 + z_4$
 - None of these
- 8) If a, b, c and u, v, w are complex numbers representing the vertices of two triangles such that $c = (1 - r)a + rb$ and $w = (1 - r)u + rv$, where r is a complex number, then the two triangles
(1985 - 2 Marks)
- have the same area
 - are similar
 - are congruent
 - none of these
- 9) If $\omega (\neq 1)$ is a cube root of unity and $(1 + \omega)^7 = A + B\omega$ then A and B are respectively
(1995S)
- 0, 1
 - 2, 1
 - 1, 0
 - 1, 1
- 10) Let z and ω be two non zero complex numbers such that $|z| = |\omega|$ and $\text{Arg} z + \text{Arg} \omega = \pi$, then z equals
(1995S)
- ω
 - $-\omega$
 - $\bar{\omega}$
 - $-\bar{\omega}$
- 11) let z and ω be two complex numbers such that $|z| \leq 1$, $|\omega| \leq 1$ and $|z + i\omega| = |z - i\bar{\omega}| = 2$ then z equals
(1995S)
- 1
 - i
 - -1
 - $-i$
- 12) For positive numbers n_1, n_2 the value of the expression $(1 + i)^{n_1} + (1 + i^3)^{n_1} + (1 + i^5)^{n_2} + (1 + i^7)^{n_2}$, where $i = \sqrt{-1}$ is a real number if and only if
(1996 - 2 Marks)
- $n_1 = n_2 + 1$
 - $n_1 = n_2 - 1$
 - $n_1 = n_2$
 - $n_1 > 0, n_2 > 0$
- 13) If $i = \sqrt{-1}$ then $4 + 5\left(\frac{-1}{2} + \frac{i\sqrt{3}}{2}\right)^{365} + 3\left(\frac{-1}{2} + \frac{i\sqrt{3}}{2}\right)^{365}$ is a real number if and only if
(1999 - 2 Marks)
- $1 - i\sqrt{3}$
 - $-1 + i\sqrt{3}$
 - $i\sqrt{3}$
 - $-i\sqrt{3}$
- 14) If $\arg(z) < 0$, then $\arg(-z) - \arg(z) =$
(2000S)
- π
 - $-\pi$
 - $\frac{-\pi}{2}$
 - $\frac{\pi}{2}$
- 15) If z_1, z_2 and z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$, then $|z_1 + z_2 + z_3|$ is
(2000S)
- equal to 1
 - less than 1
 - greater than 3
 - equal to 3
- 16) Let z_1 and z_2 be n^{th} roots of unity which subtend a right angle at the origin. Then n must be of the form
(2001S)
- $4k + 1$
 - $4k + 2$
 - $4k + 3$
 - $4k$
- 17) The complex numbers z_1, z_2 and z_3 satisfying $\frac{z_1 - z_3}{z_2 - z_3} = \frac{1 - i\sqrt{3}}{2}$ are the vertices of a triangle which is
(2001S)
- of area zero
 - right angled triangle

- c) equilateral
- d) obtuse-angled triangle

18) For all complex numbers z_1, z_2 satisfying $|z_1| = 12$ and $|z_2 - 3 - i| = 5$, the minimum value of $|z_1 - z_2|$

(2002S)

- a) 0
- b) 2
- c) 7
- d) 17

19) If $|z| = 1$ and $\omega = \frac{z-1}{z+1}$ (where $z \neq -1$), then $\operatorname{Re}(\omega)$ is

(2003S)

- a) 0
- b) $\frac{-1}{|z+1|^2}$
- c) $\left| \frac{z}{z+1} \right| \cdot \frac{1}{|z+1|^2}$
- d) $\frac{\sqrt{2}}{|z+1|^2}$

20) If $\omega (\neq 1)$ be a cube root of unity and $(1 + \omega^2)^n = (1 + \omega^4)^n$, then the least positive value of n is

(2004S)

- a) 2
- b) 3
- c) 5
- d) 6