

M.N.U. JAYARAJ NADAR HIGHER SECONDARY SCHOOL

CLASS: XII

MATHEMATICS

TIME: 1:30 HR

PREPARATORY TEST

MARKS: 50

ANSWER ALL THE QUESTIONS

PART – A

[5 x 2 = 10]

1. Find a matrix A if $\text{adj}A = \begin{bmatrix} 2 & -4 & 2 \\ -3 & 12 & -7 \\ -2 & 0 & 2 \end{bmatrix}$

2. Verify the property $(A^T)^{-1} = (A^{-1})^T$ with $A = \begin{bmatrix} 2 & 9 \\ 1 & 7 \end{bmatrix}$

3. Find the matrix A for which $A \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}$

4. If $|z| = 2$, prove that $3 \leq |z + 3 + 4i| \leq 7$

5. Find the square root of $4 + 3i$

PART – B

[5 x 3 = 15]

6. If $A = \begin{bmatrix} 0 & -3 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & -3 \\ 0 & -1 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$

7. If $F(\alpha) = \begin{bmatrix} \cos \alpha & 0 & \sin \alpha \\ 0 & 1 & 0 \\ -\sin \alpha & 0 & \cos \alpha \end{bmatrix}$ show that $(F(\alpha))^{-1} = F(-\alpha)$

8. Find the value of the real numbers x and y if the complex number $(2+i)x + (1-i)y + 2i - 3$ and $x + (-1+2i)y + 1 + i$ are equal

9. If z_1, z_2 and z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = |z_1 + z_2 + z_3| = 1$ find the value of $\left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right|$

10. Prove the following $\left(\frac{19-7i}{9+i} \right)^{12} + \left(\frac{20-5i}{7-6i} \right)^{12}$ is real

PART – C

[5 x 5 = 25]

11. Solve $2x + 3y - z = 9$, $x + y + z = 9$, $3x - y - z = -1$ using inversion method:
12. In a T-20 match, a team needed just 6 runs to win with 1 ball left to go in the last over. The last ball was bowled and the batsman at the crease hit it high up. The ball traversed along a path in a vertical plane and the equation of the path is $y = ax^2 + bx + c$ with respect a xy-coordinate system in the vertical plane and the ball traversed through the points $(10, 8)$, $(20, 16)$, $(40, 22)$ can you conclude that the team won the match? Justify your answer. (All distances are measured in metres and the meeting point of the plane of the path with the farthest boundary line is $(70, 0)$)
13. The upward speed $v(t)$ of a rocket at time t is approximated by $v(t) = at^2 + bt + c$, $0 \leq t \leq 100$ where a , b and c are constants. It has been found that the speed at times $t = 3$, $t = 6$ and $t = 9$ seconds are respectively 64, 133 and 208 miles per seconds. Find the speed at time $t = 15$ seconds (Use Gaussian elimination method):
14. Show that the points $1, \frac{-1}{2} + \frac{i\sqrt{3}}{2}$ and $\frac{-1}{2} - \frac{i\sqrt{3}}{2}$ are the vertices of an equilateral triangle
15. If $z = x + iy$ is a complex number such that $\text{Im}\left[\frac{2z+1}{iz+1}\right] = 0$, show that the locus of z is $2x^2 + 2y^2 + x - 2y = 0$

*******ALL THE BEST*******