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Course : MAT-215

Ans to the Q. No - 1

* The Rank - Nullity Theorem:

The rank nullity theorem states that for any matrix A, The rank of A (the dimension of the column space) equals the number of A or columns of ~~A~~. A.

In summary

Matrix size	max Rank	min nullity
4x4	4	0
3x5	3	2
5x3	3	0

Ans to the Q. No - 2

(2) It is Given in the question that the null space of A is a line thus it can be interpreted that it is 1 - dimensional subspace consider the rank nullity theorem:

$$\rho(A) + nullity(A) = dim(A)$$

Here, $\rho(A)$ is the rank of A.

putting the values in the above equation.

$$\rho(A) + 1 = 3$$
$$\rho(A) = 2$$

Hence it can said that it is the dimension of its row or column space. These it can be said that column space cannot be a line, but it will be a plane.

Ans to the Q. No - 3

* Relating the Determinant to the characteristic polynomial. the key to this problem lies in understanding the relationship between the determinant of a matrix and its characteristic polynomial.

We know that $P(A) = \det(A - \lambda I)$. if we evaluate $P(0)$ we get:

$$P(0) = \det(A - 0I) = \det(A)$$

* Evaluating the characteristic polynomial, we are given $p(\lambda) = \lambda^3 - 2\lambda^3 + \lambda + 5$. To find the determinand of A, we simply need to evaluted $P(0)$:

$$P(0) = (0)^3 - 2(0^3) + (0) + 5 = 5.$$

Therefore, the determinant of matrix A, denoted as det (A) is ... 59.