

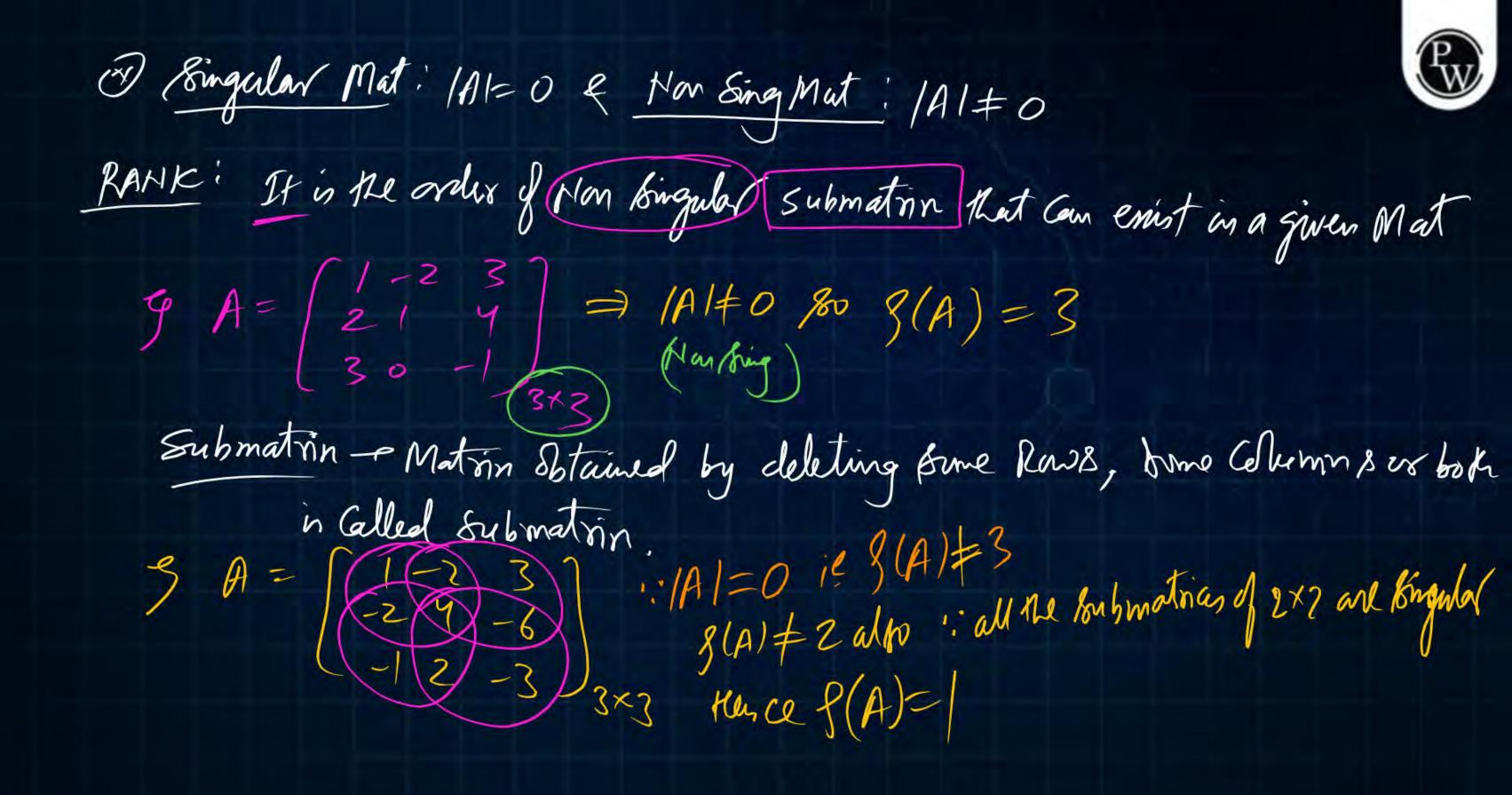


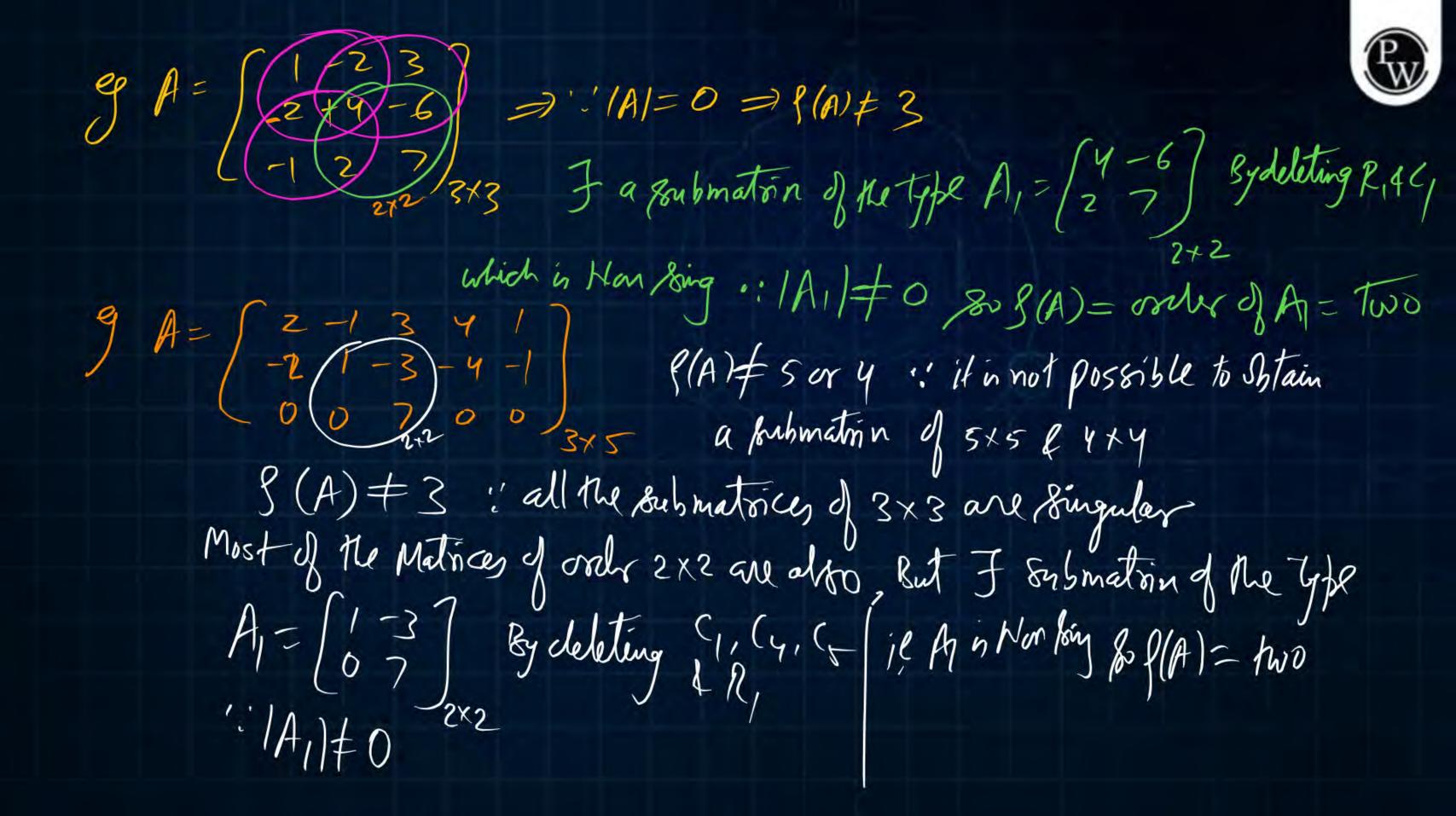
LINEAR ALGERA (LEC-2)

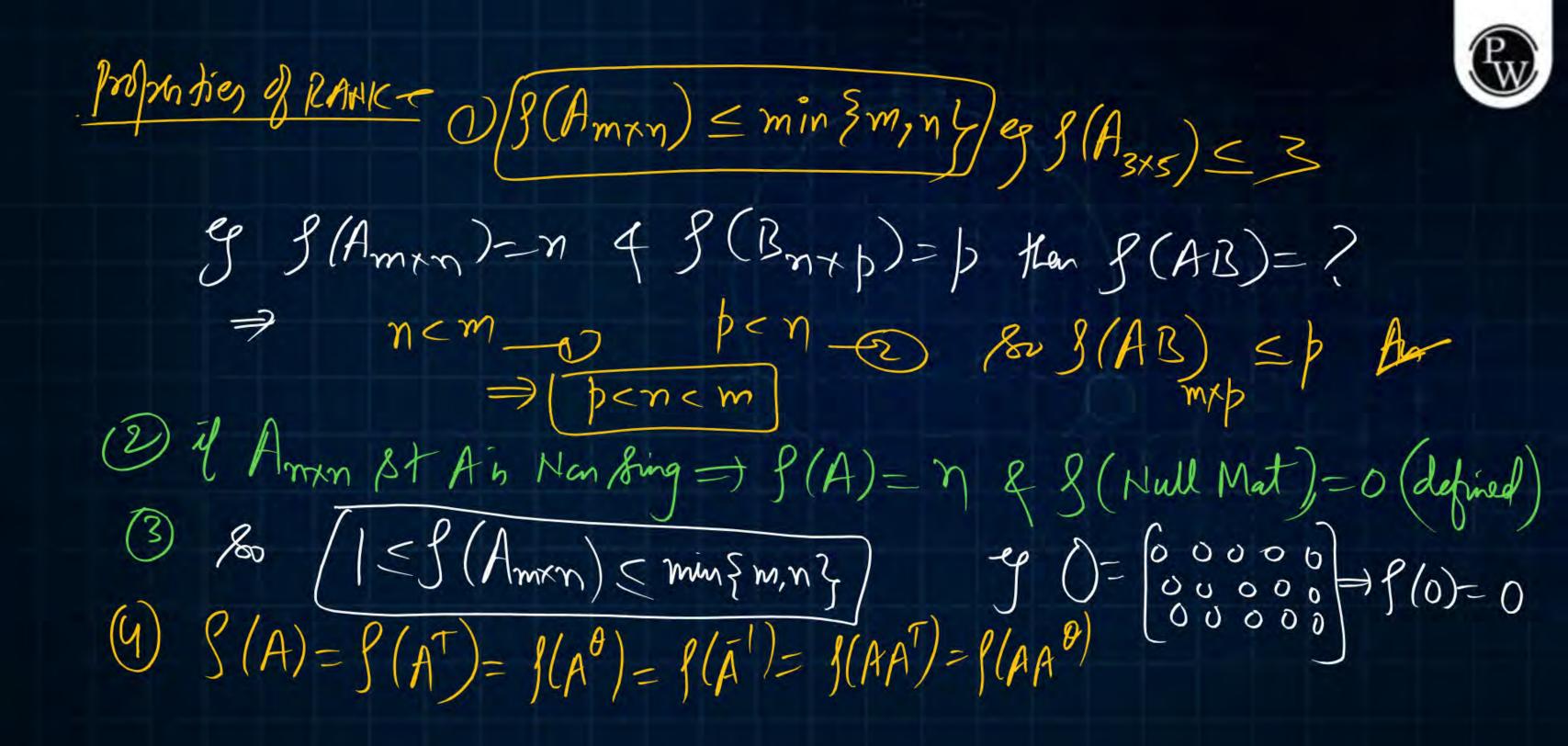
- (1) RANK
- (2) VECTORS (LD/LI)
- 3) Non Komogeneous kystem

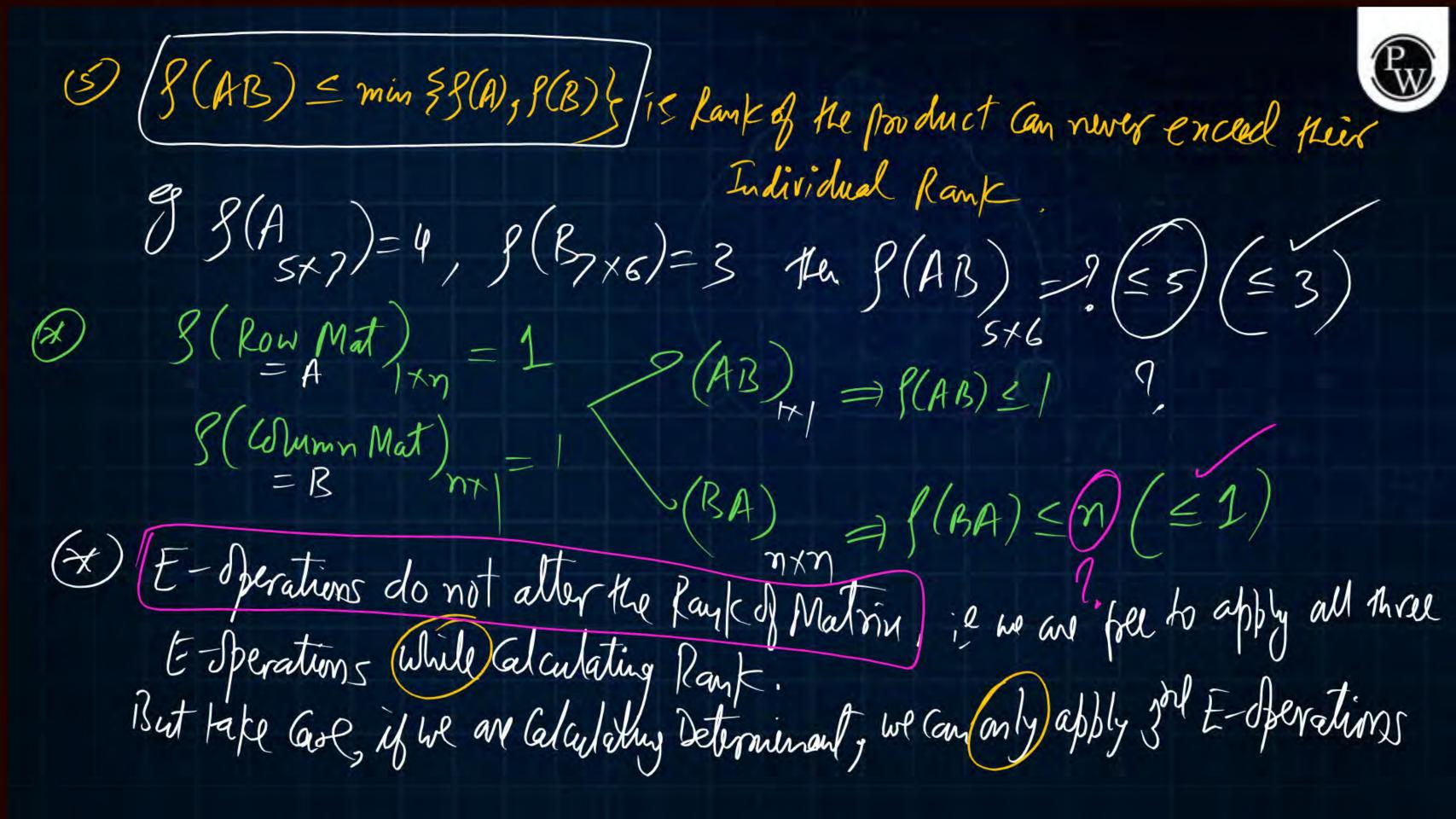




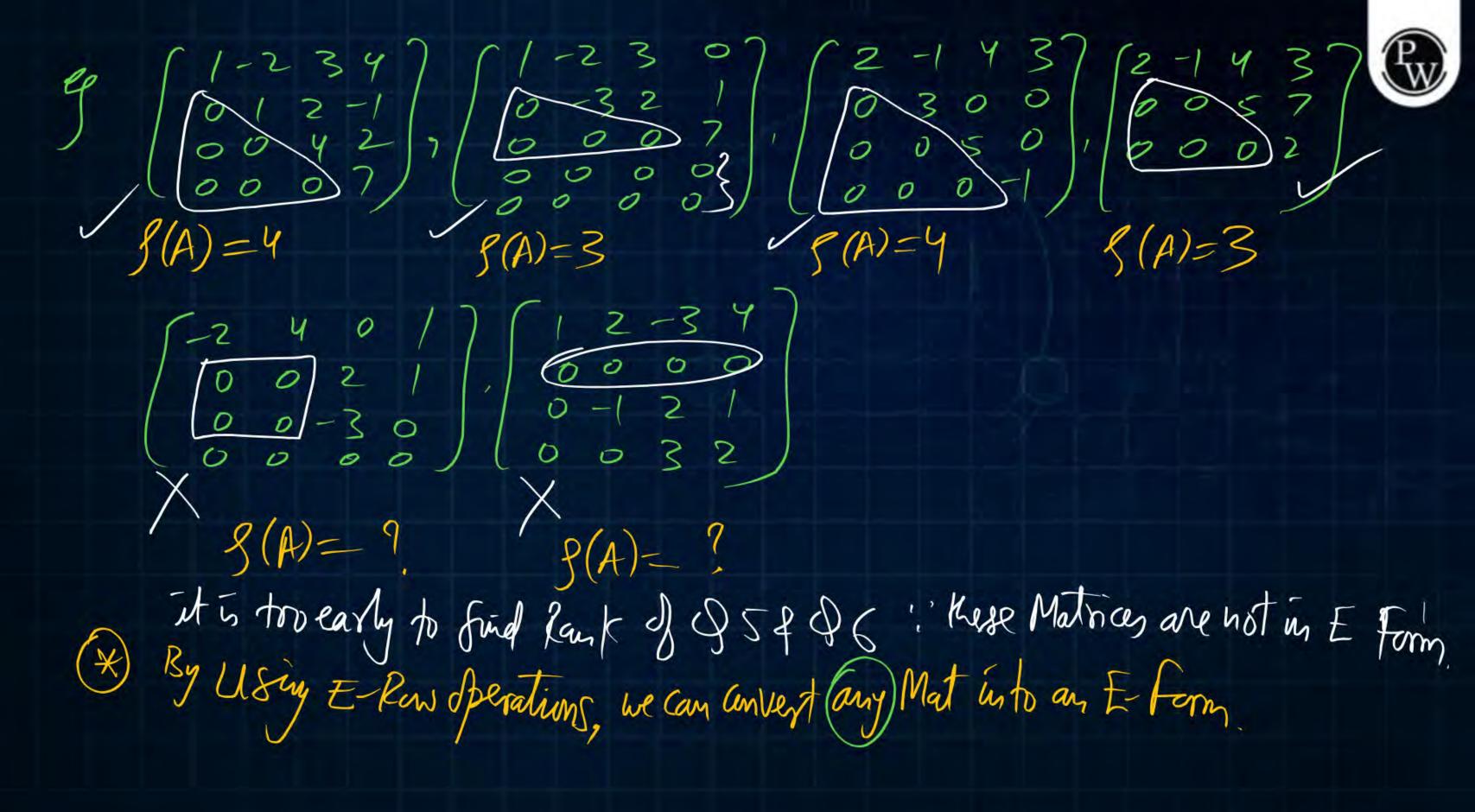








E-Operations;	Equivalent Mat = Matrix Obtained by applying E-Operations
O Ri O Ri	10 Each MIL
3 Ri - KRi	Equivalent Matrices have same Rank.
3) Ri - RitkRj	
Echelon form: Mut Amon is said to be in an E-form if (1) No. of Zeros before the 1st the Non Zero element in a Row Should be in an Increasing order in the subsequent Pows. (2) All Zero Rows (if exist) should occur at a bottom of a Matrin (3) I (Echelon form) - No. of Non Zero Rows.	
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Echelon ferm)=	No. of Nan Zero Rows.



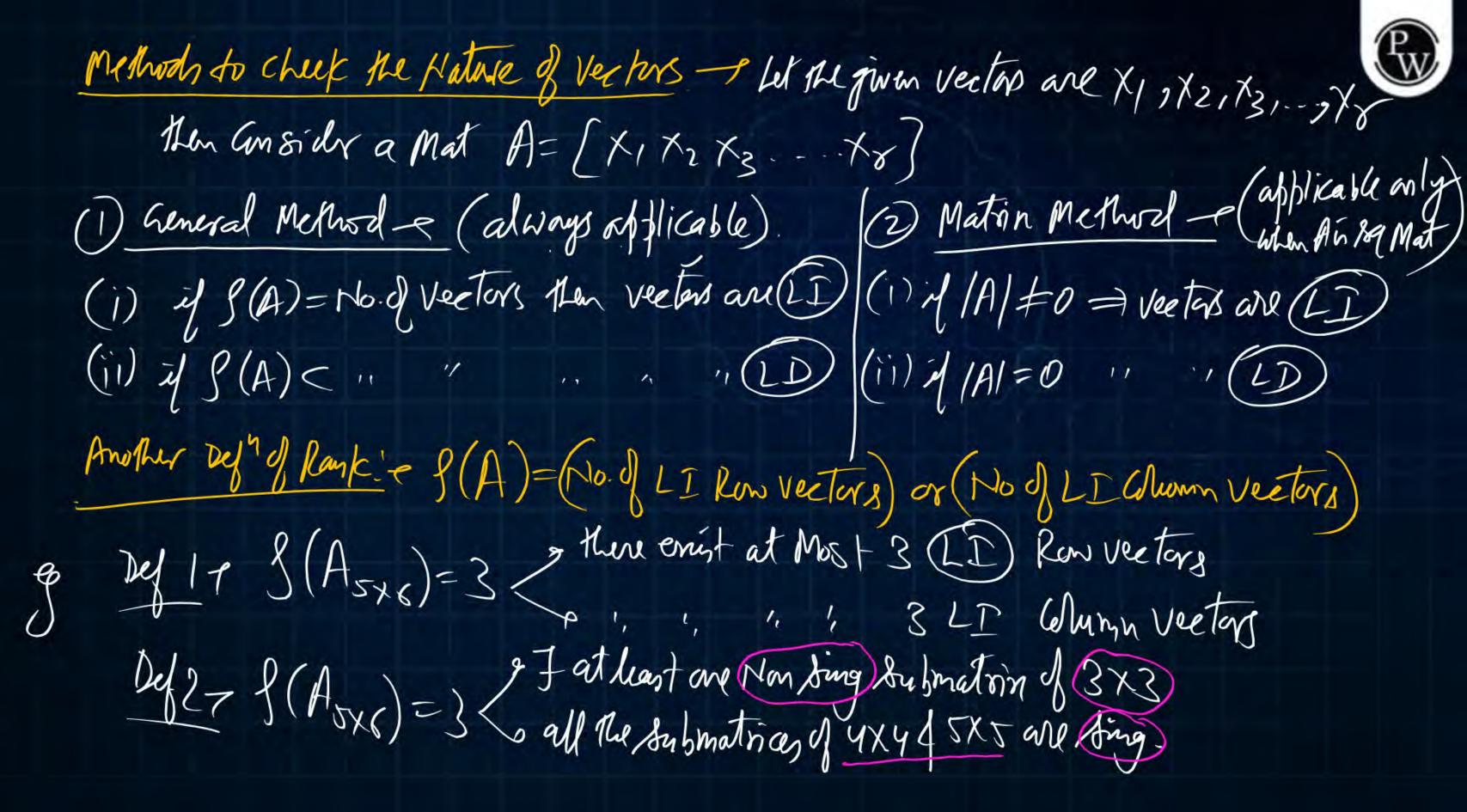
L-D& L-I vectors

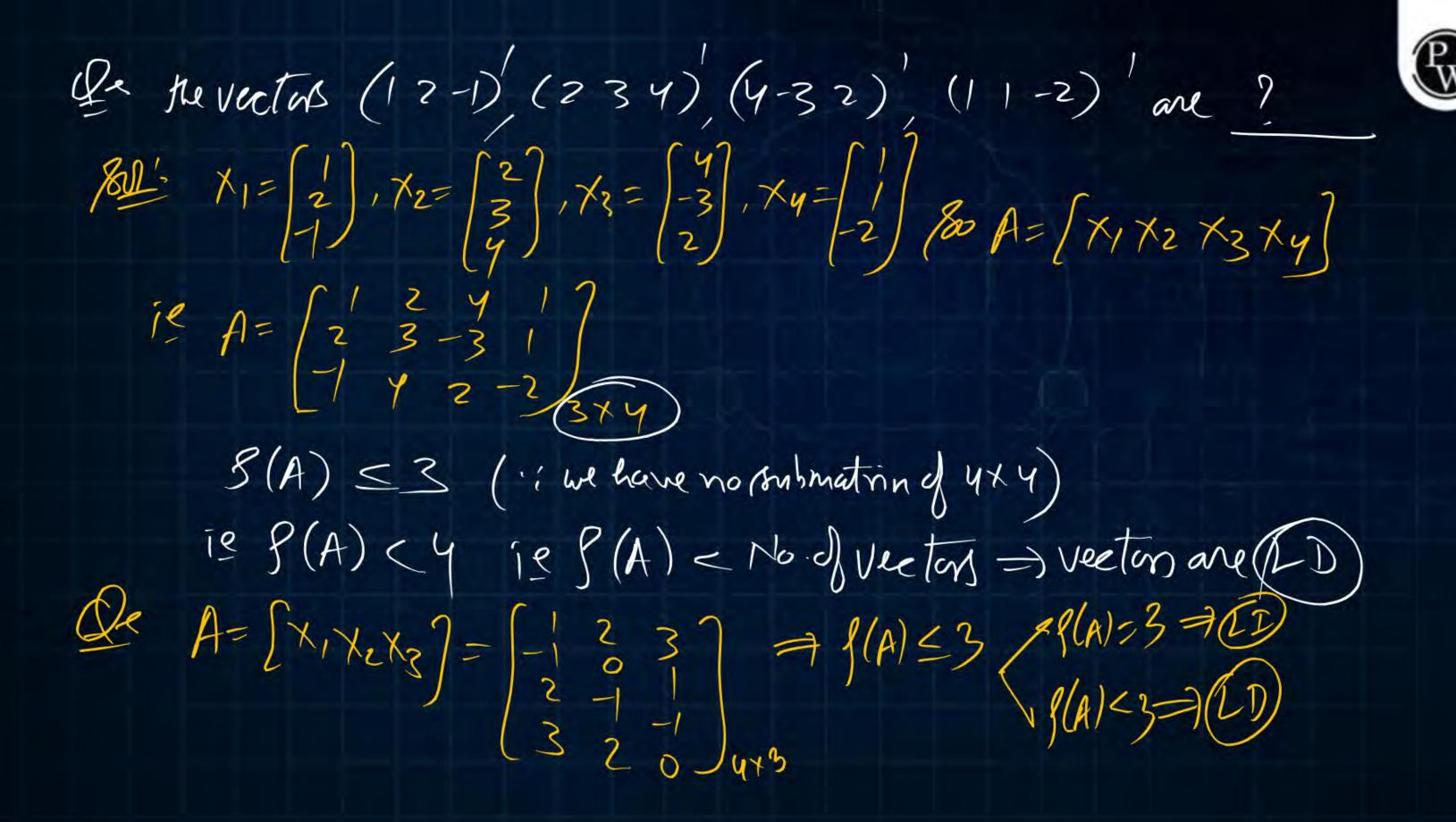


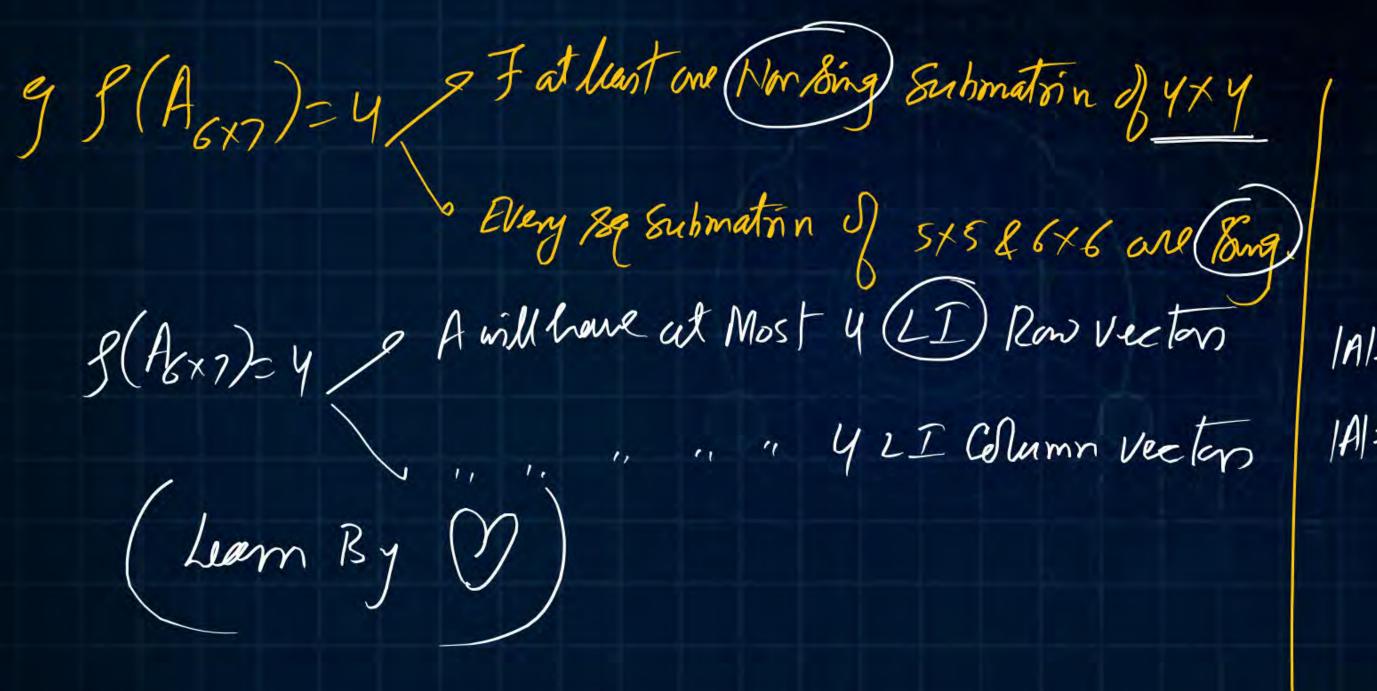
vector - s Any Column Mat is considered as Vectors is X= (m) nx) Any low Mat can also be considered as Vector $\chi = [n_1 n_2 n_3 ... - n_n]_{\chi = 0}$ $g \quad AR = 2\hat{\imath} - 3\hat{\jmath} + 4\hat{\imath} \implies \chi = \begin{bmatrix} -\frac{2}{3} \\ -\frac{3}{3} \end{bmatrix} = 3 - \text{Vector}$ ie Azxy = Patital Rhan 3 Row veeting 4 4 Column Vectors
4 (2 13 (4)



Linearly Independent vectors of y we have no linear relationship by the vectors Hen veeled are corrected and (3), (3) (4)MT By observation, X1-X2=-1x3 ·: |A|= ---=0 or [3x1-5x2+x3=0] so vector one (I) i linear felationship enist of vector are (LD)









1A1+0=)(II)
1A1=0=> LI

If A and B are matrices of same order then

(a)
$$\rho(A+B) \leq \rho(A) + \rho(B)$$

(b)
$$p(A + B) \ge p(A) + p(B)$$

(c)
$$\rho(A + B) = \rho(A) + \rho(B)$$

(d) None of the above

$$f(A+B) \leq f(A)+f(B)$$



Applying elementary transform to a matrix its rank _____.

(a) increases

(b) decreases

- (e) does not change
- (d) None of the above



If for a matrix, rank equals both the number of rows and number of columns, then the matrix is called



- (a) non-singular
- (b) singular

(c) transpose

(d) minor



MCB

The rank of a 3 × 3 matrix C (= AB), found by multiplying a non-zero column matrix A of size 3 × 1 and a non-zero row matrix B of size 1 × 3, is

(a) 0

(b) 1

(c) 2

(d) 3

$$A_{3\times1} \Rightarrow S(A) = | 1 \Rightarrow C = AB = A_{3\times1} B_{1\times3} = (AB)$$
 $B_{1\times3} \Rightarrow S(B) = | 1 \Rightarrow C = AB = A_{3\times1} B_{1\times3} = (AB)$
 $S(C) = 1 \Rightarrow S(C) = 1 \Rightarrow S(C)$



The rank of the matrix $\begin{bmatrix} 0 & i & -i \\ -i & 0 & i \end{bmatrix}$ is _____ (a) 1 (b) 2 (c) 3 (d) 4

An stew symm Mat odd order is of
$$3\times3$$
 go $|A|=0$

$$A_1 = \begin{bmatrix} i-i \\ 0 \end{bmatrix} = |A_1| = i^2 - 0 = -1$$

$$i \in S(A) \neq 3$$

$$i \in A_1 \text{ is Han Sing} \Rightarrow f(A) = 2$$

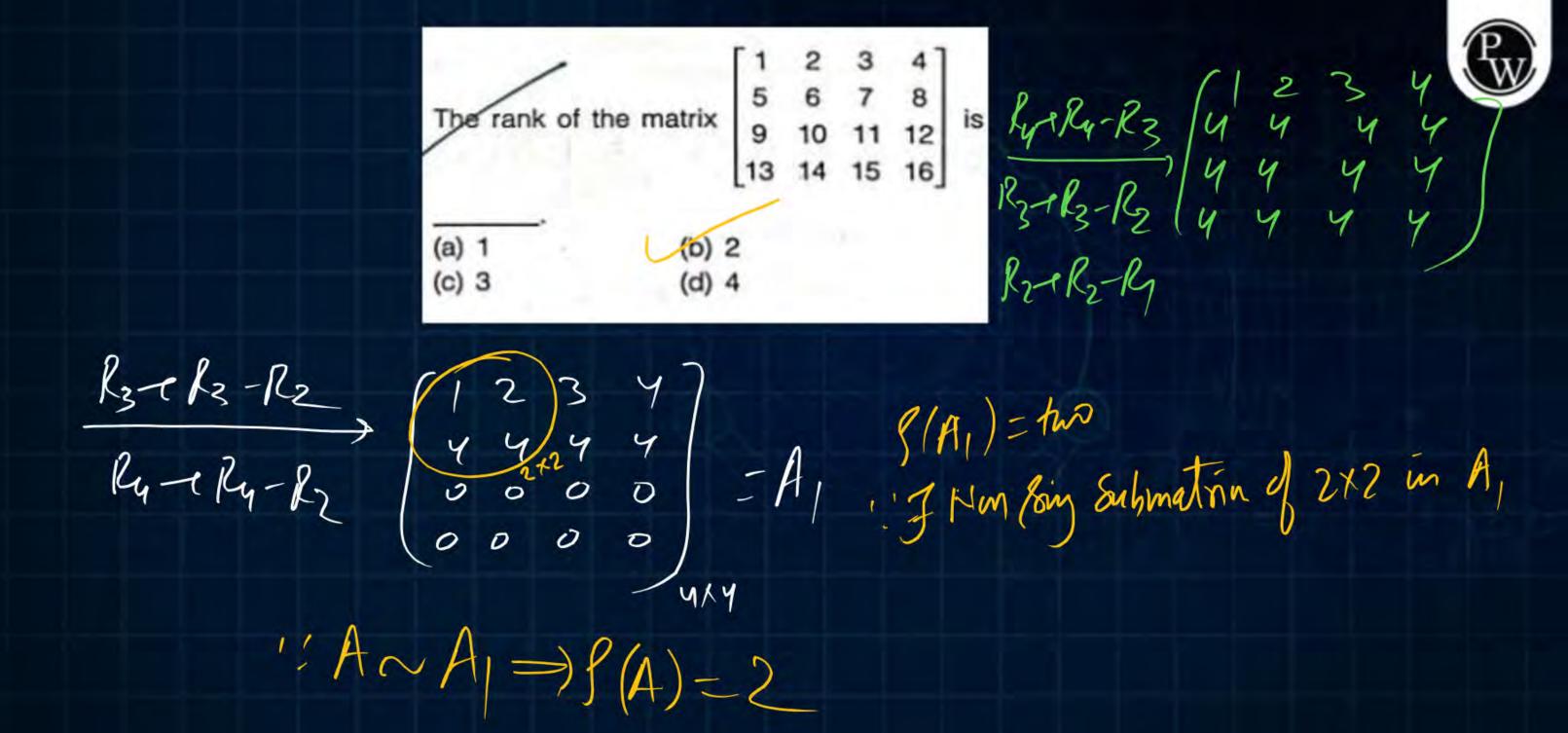
The rank of 4 × 4 skew-symmetric matrix



$$|A| = \text{perfect 89 uard}$$

$$|A| = |4 - (2)^{2} \text{ i.e. } |A| + 0 \text{ i.e. } A \text{ is } K \text{ on } \beta \text{ ing.}$$

$$|3(A) = |4|$$





$$f_{3-1}f_{3}-3f_{1}$$
 $\begin{cases} 0 & 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{cases} = A_{1} & (3(A_{1}) = one)$
 $f_{3-1}f_{3}-2f_{1}$ $(0 & 0 & 0 & 0)$ $(A-A_{1}) = f(A) = one$



Let P =
$$\begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$$
 and Q = $\begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{bmatrix}$ be two

matrices. Then the rank of P + Q is_____

P+8=
$$\begin{pmatrix} 6 & -1 \\ 8 & 9 \\ 10 \\ 8 & 8 \end{pmatrix}$$
 $\begin{pmatrix} 8 & 10 \\ 10 \\ 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 9 & 10 \\ 0 & -1 & -2 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 8 & 8 & 8 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 9 & 10 & -1 & -2 \end{pmatrix}$ $\begin{pmatrix} 10 & -1 & -2 \\ 0 & -1 & -2 \end{pmatrix}$

The rank of a matrix A is defined as _____.

- (a) The number of zero rows in A.
- (b) The number of linearly dependent rows (or columns) in A.
- (c) The number of linearly independents rows (columns) in A.
- (d) The number of such columns which has been obtained by linear combination of some other columns in A.



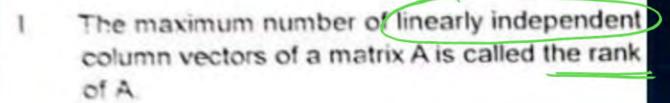


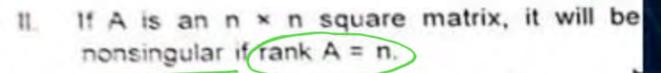
 $q_1, q_2, q_3... q_m$ are n-dimensional vectors with m < n. This set of vectors is linearly dependent. Q is the matrix with $q_1, q_2, q_3...q_m$ as the columns. the rank of Q is

- (a) less than my (b) m
- (c) between m and n (d) n

$$Q = \begin{cases} 9,9293...9m \\ \text{mm} \end{cases}$$
 where $9 = \begin{cases} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{cases}$ $S(Q) < No d)$ vectors (: vectors are LD)

Consider the following two statements:





With reference to the above statements, which of the following applies?

- (a) Both the statements are false
- (b) Both the statements are true
- (c) I is true but II is false
- (d) I is false but II is true



System of Equations

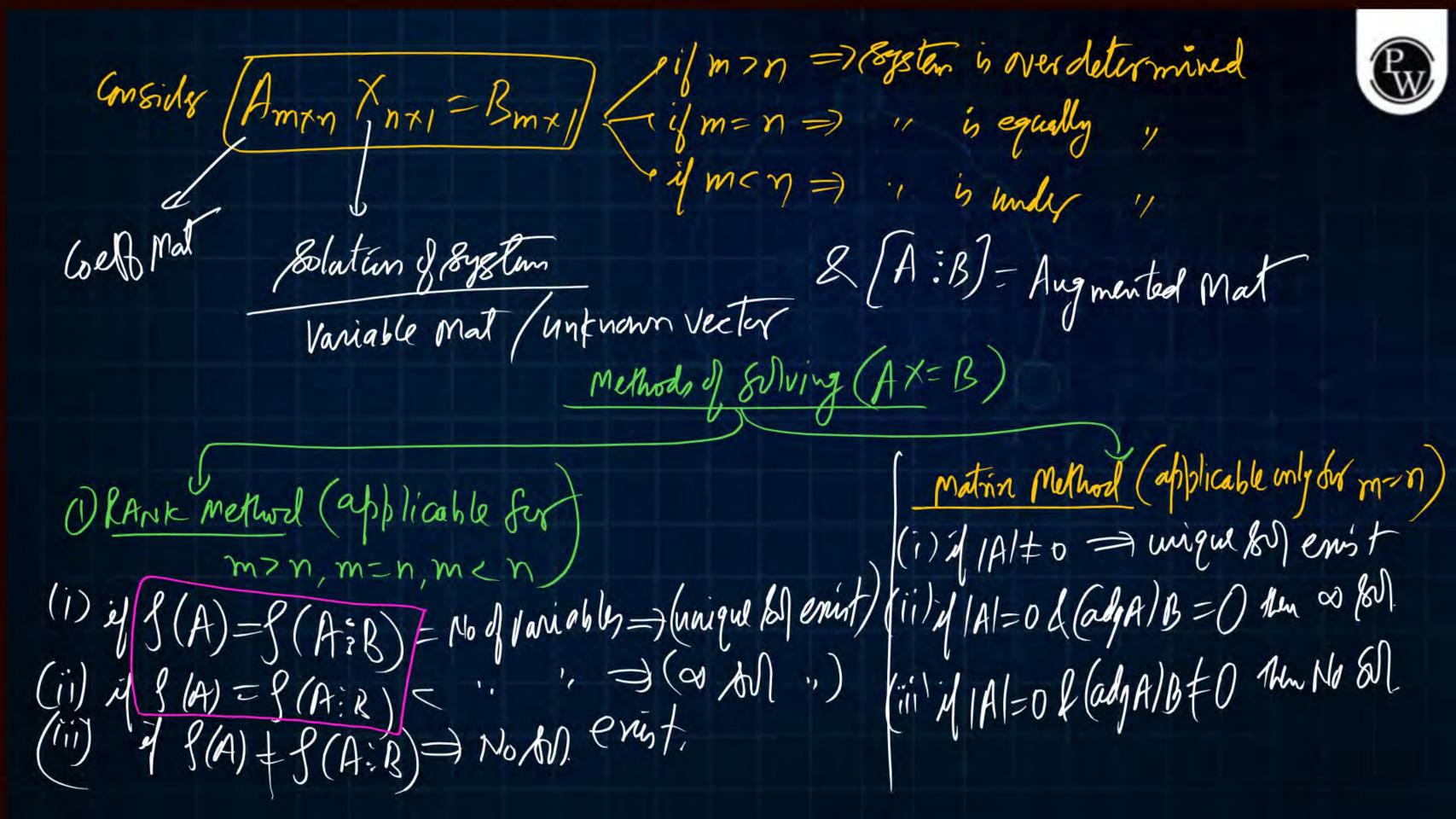


Non Momogeneous system (AX=B)

Nomogeneous System (AX = 0)

27-7+43=3 7427-23=-31-4+43=0 3n+2y+33=2

Au13/3/1 = Byx1





(1) Consistent bystem - y shere exist so (Whether hingue or as)
Inconsistent in - y shere exist NO So).

(2) N. Cond" For a system to be consistent is [S(A)-S(A:B)]

If the system of *n* linear equations in *n* unknowns has more than one solution, then its associated matrix ____.

- (a) has rank < n
- (b) has rank = n
- (c) has rank > n
- (d) has rank one

given, $A_{n \times n} \notin A \times = B$ here $\infty \notin \mathbb{N}^n \Rightarrow f(A) = g(A:B) < n$

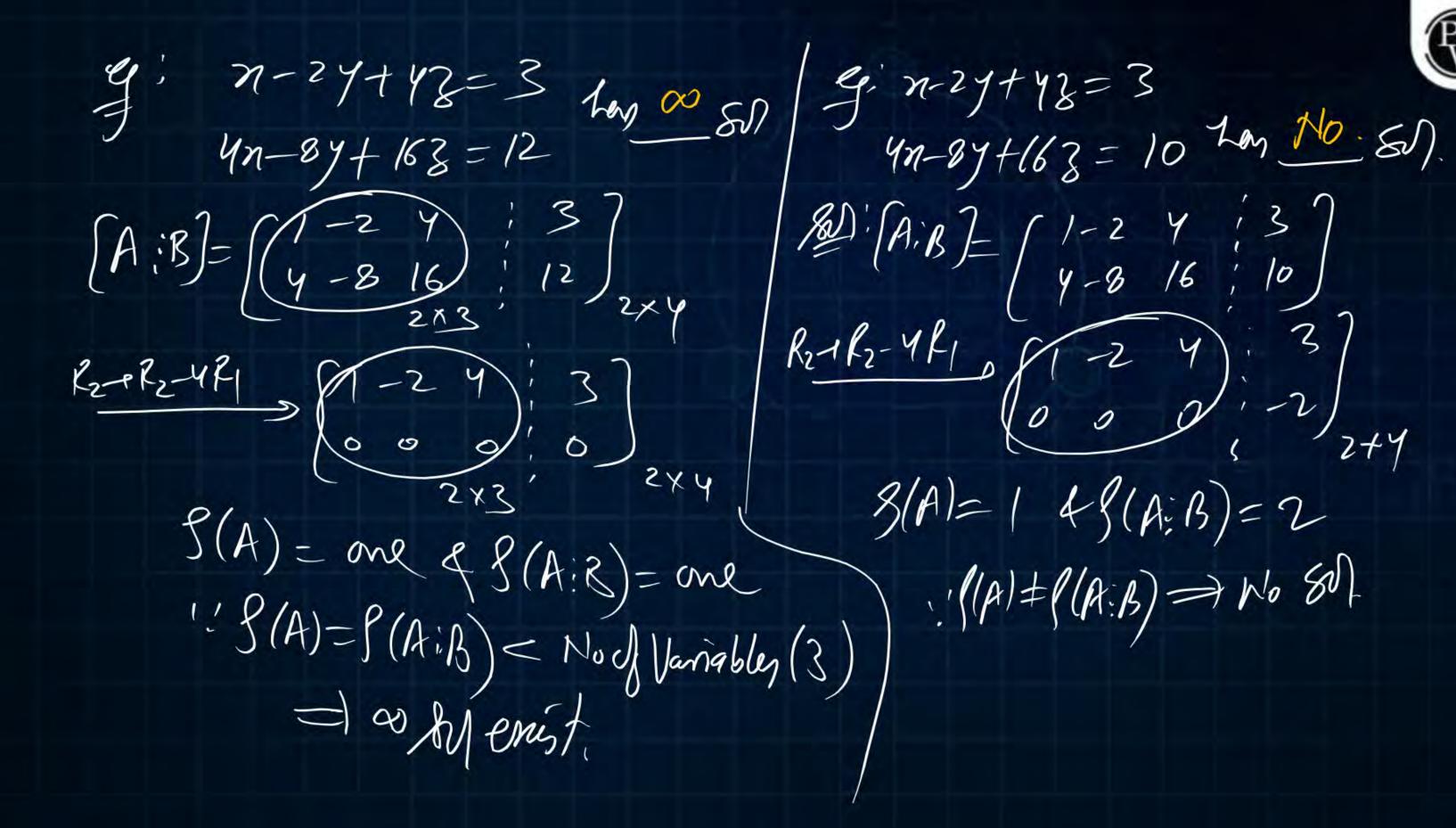


Let M be an $m \times n$ (m < n) matrix with rank m.

Then

- (a) for every b in R^m , Mx = b has unique solutions.
- (b) for every b in R^m , Mx = b has a solution but it is not unique.
- (c) there exists $b \in R^m$ for which Mx = b has no solution.
- (d) None of the above

 $M \times = \mathbb{R} \Rightarrow \text{unique} \times$ $M \times = \mathbb{R} \Rightarrow \infty \text{ sol} \times$ $\mathcal{R}(M) = \mathcal{R}(M; \mathcal{R}) \subset \mathcal{N}(M) \cup \mathcal{R}(M; \mathcal{R}) = \mathcal{R}(M; \mathcal{R}) \Rightarrow \mathcal{R}(M; \mathcal{R}) \Rightarrow$





The system of equal
$$x + y + z = 6$$

 $x + 4y + 6z = 20$
 $x + 4y + 1z = m$

12-1/2-K

R3-18-12

$$x + y + z = 6$$

$$x + 4y + 6z = 20$$

$$x + 4y + Iz = m$$

has NO solution for values of I and m given by

