DS & AI
CS & IT

Linear Algebra

Lecture No. 05



Recap of previous lecture









Topic

Types of Matrices

Topics to be Covered







Topic

O Remaining Part of Types of Matrices

Vectors & their Properties

Same Confusions:



(1) $(A+B+C)^T = A^T + B^T + C^T$

(2) $(A+B+C)^{\Theta} = A^{\Theta} + B^{\Theta} + C^{\Theta}$

3) Tr(A+B+C)=Tr(A)+Tr(B)+Tr(C)

(9) 1A+B+C| < |A|+1B|+|C|

(3) (A+B+C) = alg(A+B+C) (A+B+C) = |A+B+C|

(G) AB+BA Post Tr(AB)=Tr(BA)

1) | ABC | = | Al-1131-10 |



(i) (ABC) = CTBTAT

(ii) (ABC) = CBBBAB

(iii) (ABC) = [[B] A]

QUICK RECAP!

- O singular Most if IAI=0
- 1 Honding Mat if IAI # 0
- 3 Invertible Mot if A enist, A= adj A
- (Real Mat if A=A or (A=A)
- (3) Complen Mat if A # A
- 6) Symm Mat if A'= A
- (7) Skew bymin Math A=-A
- (8) Hermitseun Mat if A= A
- (9) Skew them Mat if A= A

10) Idempotent if A=A

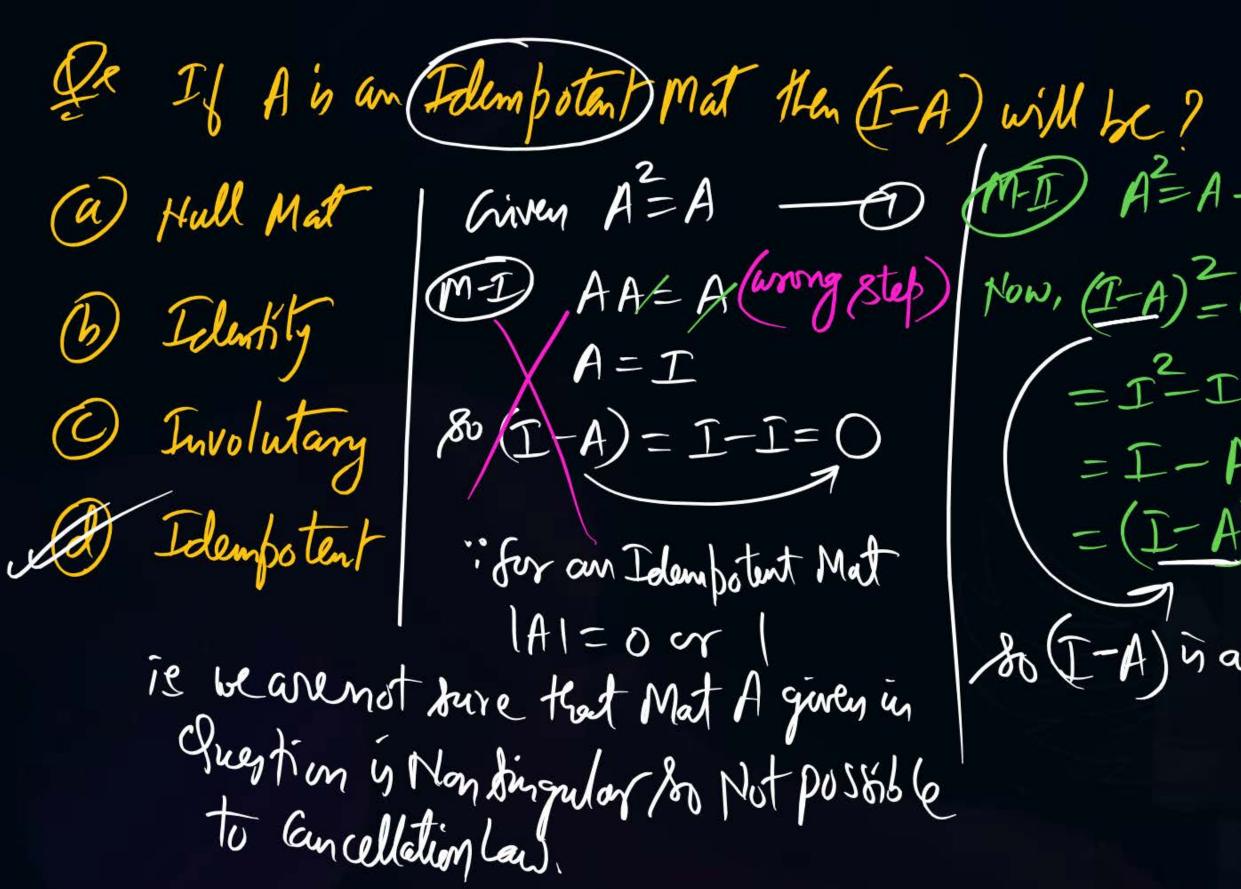
1 Involutary of A= I

12) Hilpotent if A = 0, K= least tre int

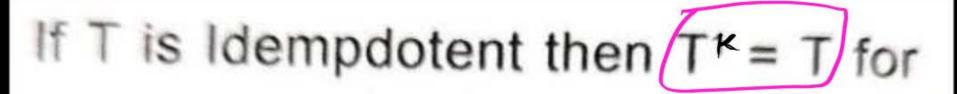
(13) U.T.M A=(aij) = 0 + 1>j

(14) L-T.M A= (aij) nxn-0 Hiej

A=\(g_i \) = \ at least une element \(i, \) \ \ Non Zeros



Given A=A - @ (given) NOW, (I-A) = (I-A). (I-A) =IZIA-AI+A =I-A-A+(A) =(I-A)So (I-A) is an Idempotent Mat.



- (a) k = 2
- (b) All integer k
- (c) All positive integer k ≥ 2
- (d) All of the above

= K= 2,3,4,5,6

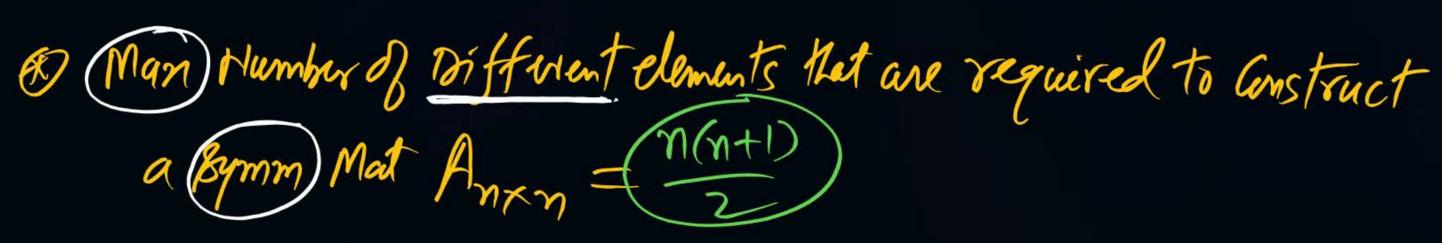
1e K72

Last Brast: A=A given

(I-A) = A(I-A) ???

= AI-A

= O





g A= (ab) is Max elements Required = 3 = (1+2)

$$9A = \begin{cases} abcd\\ bcd\\ y\\ d$$

$$=6=(1+2+3)$$

1.
$$I = 10 = (1+2+3+4)$$

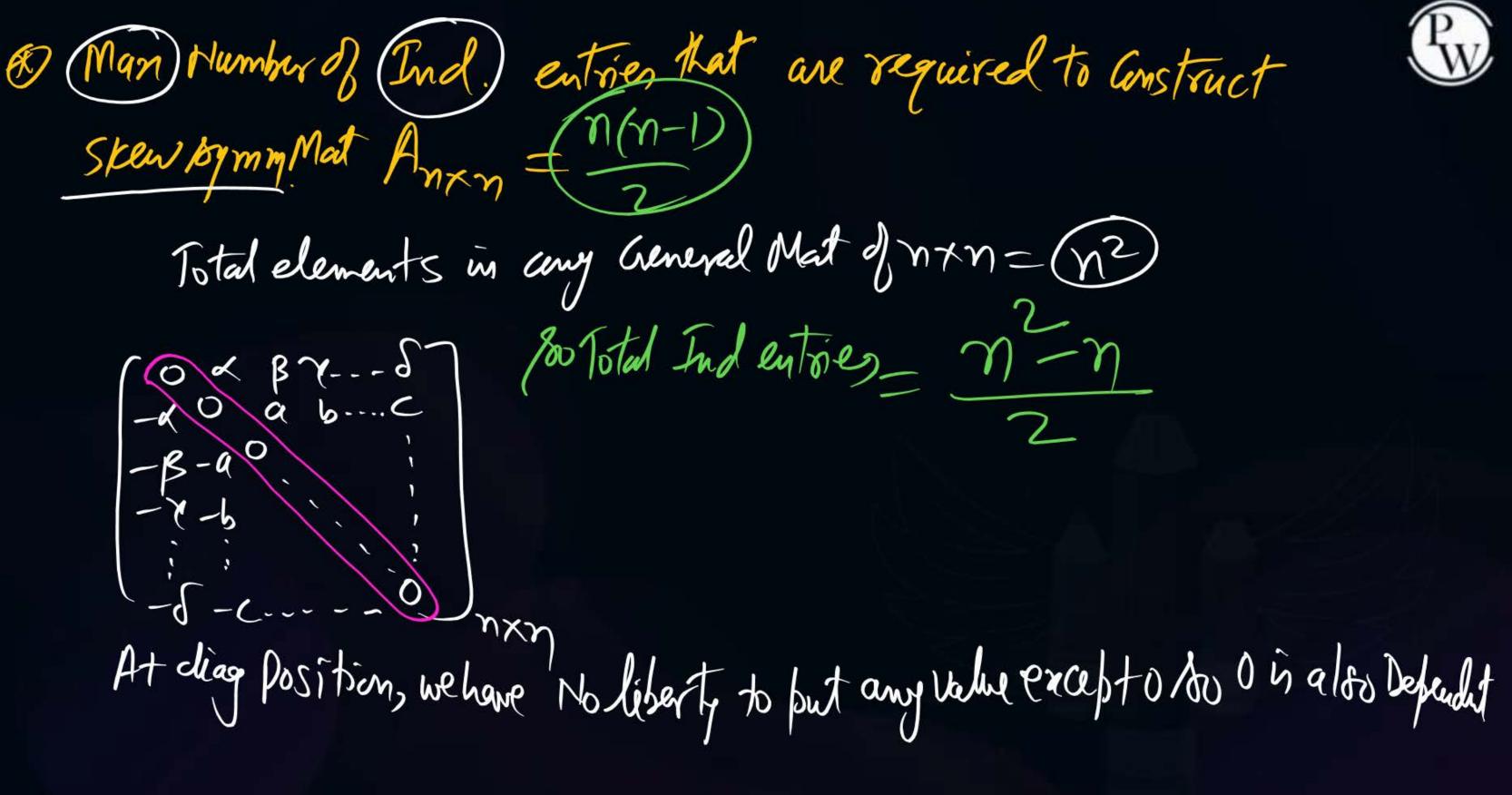
1. $I = 1+2+3+--+m = \frac{m(m+1)}{2}$



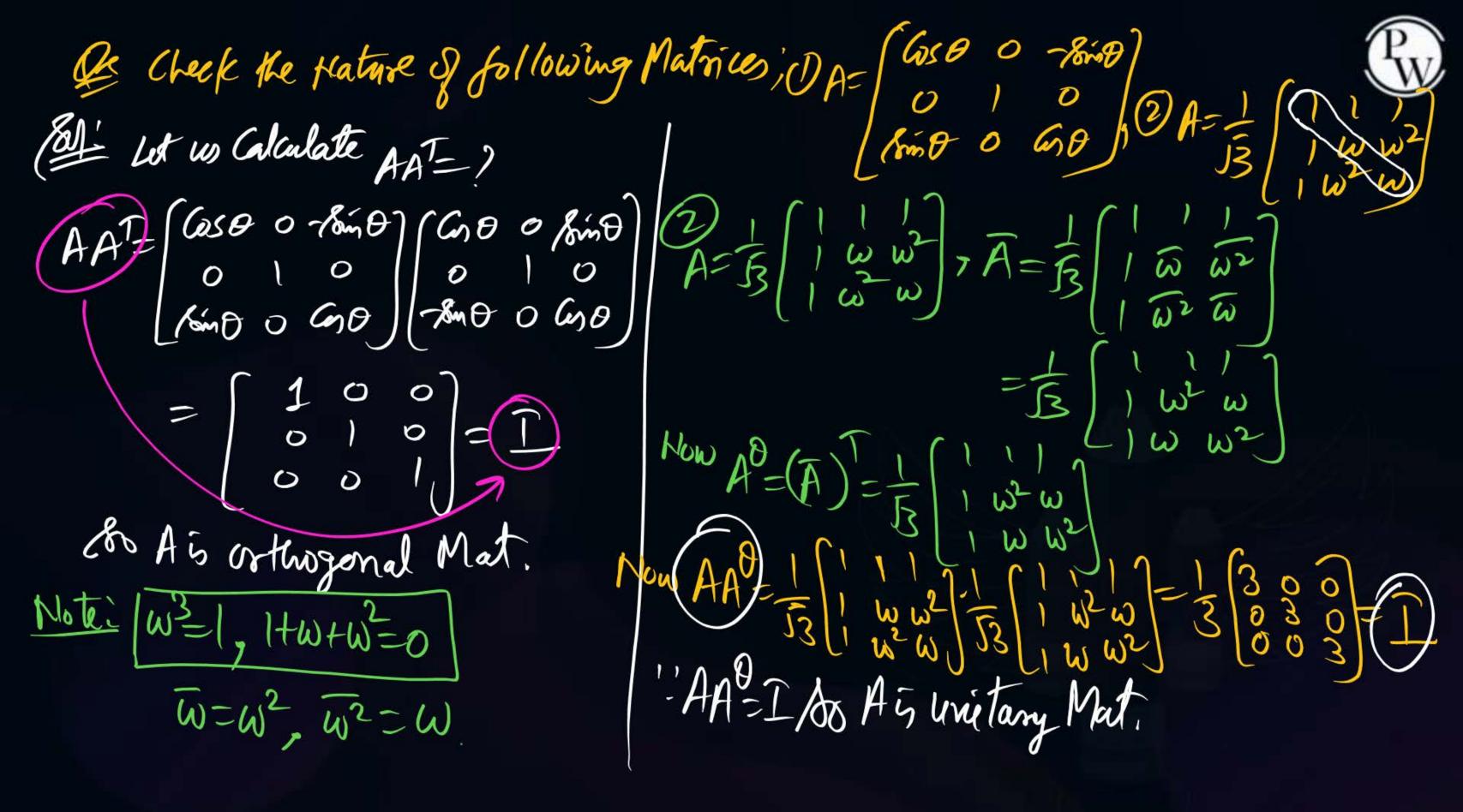
= Symm. Mat 80 Man Tofferent eliments

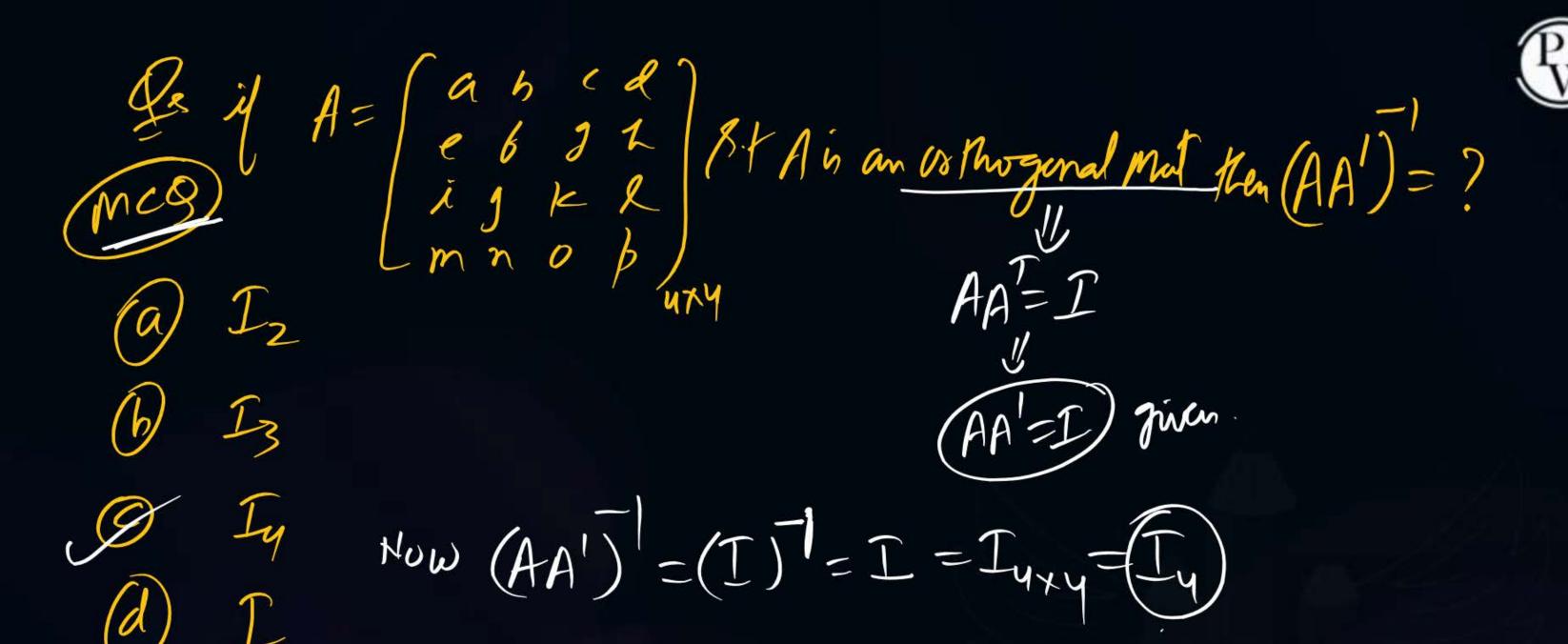
 $=\frac{\eta+\eta}{2}=\frac{\eta(\eta+1)}{2}$

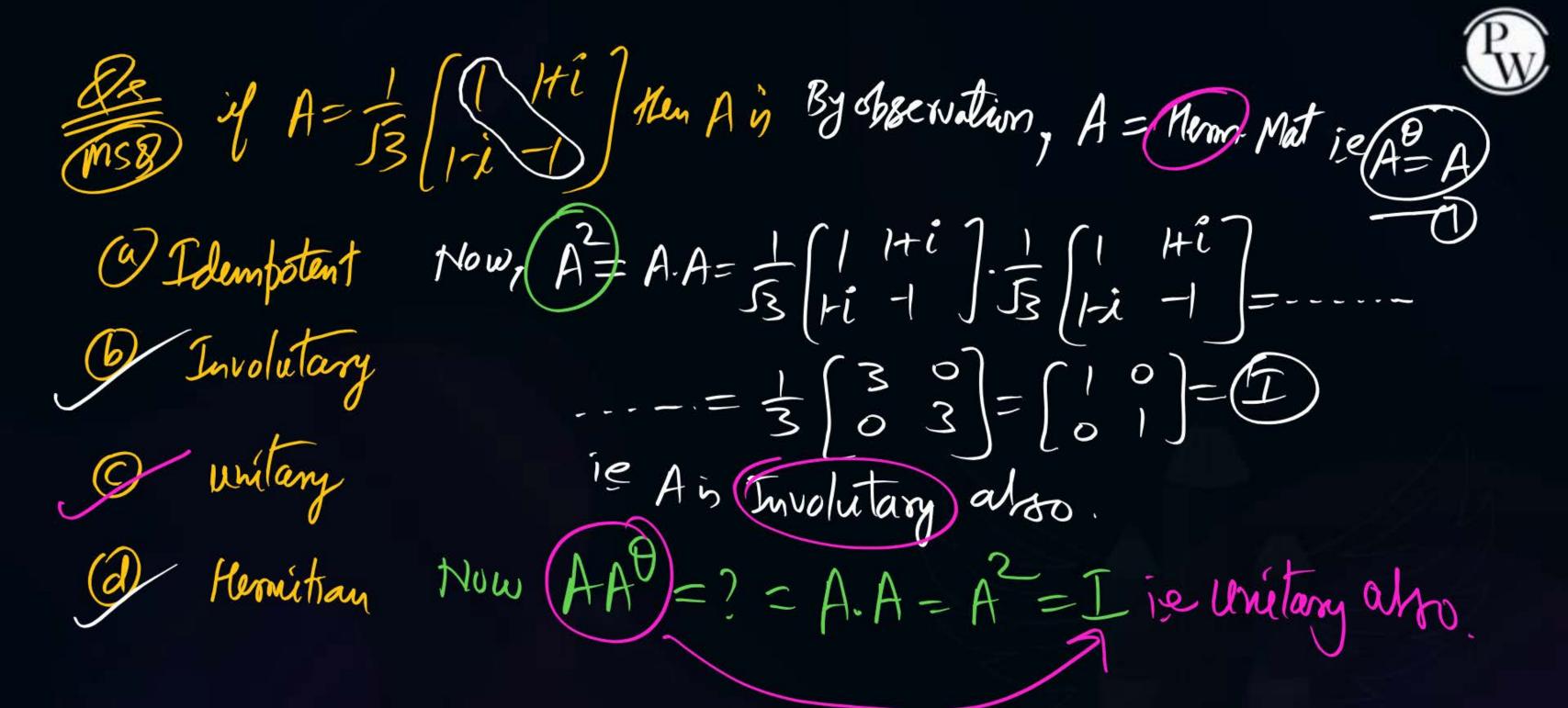
If A'n any General Mat of nxn then Total elements in A- (2)

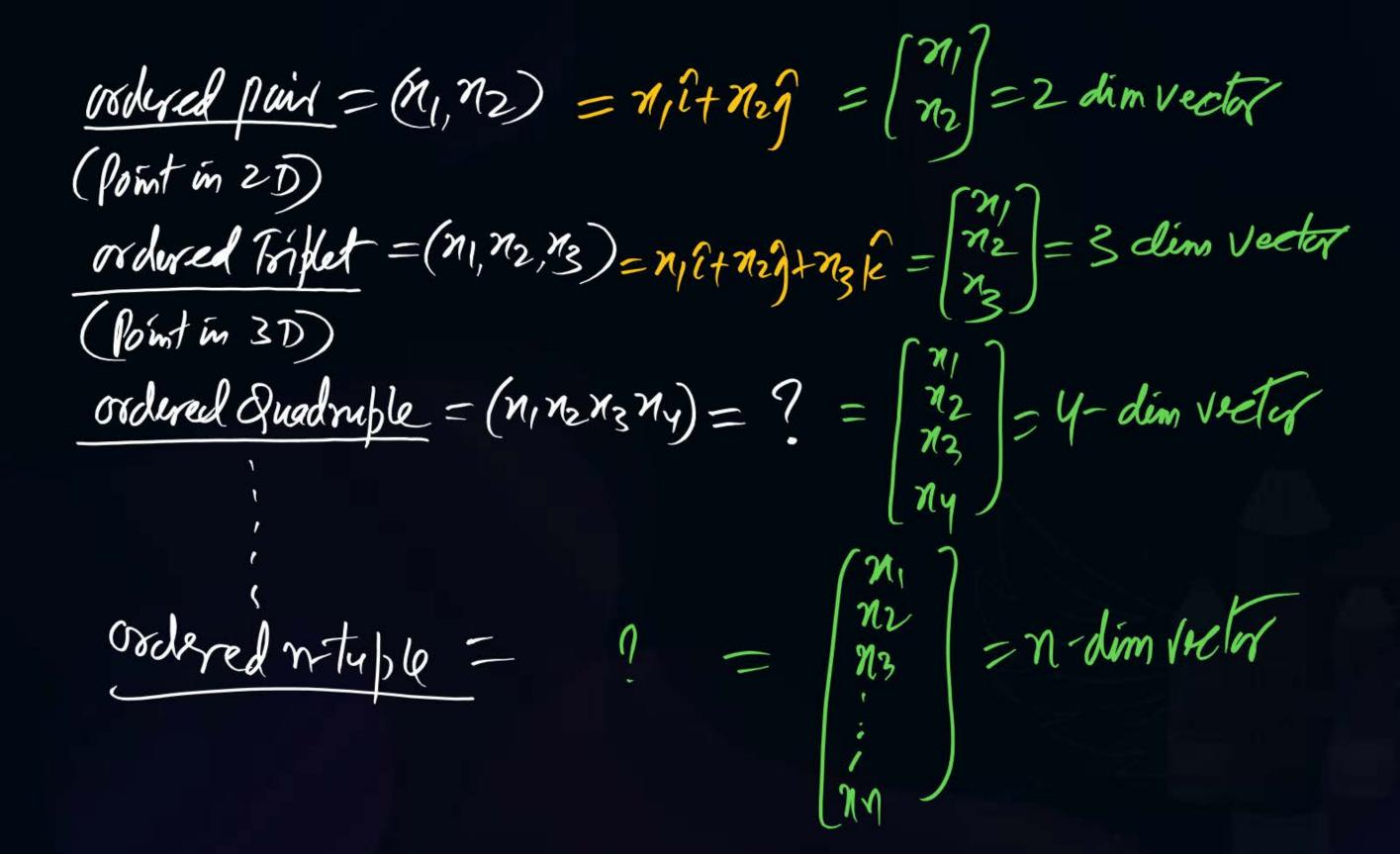


or thogonal Mat - 5 Ib [AA] I (or A = AT) then A is Called Orthogonal Mat Unitary Mat = I/AA=I/(or A=A) Hen A is Called Unitary Mat. (3) unitary Mat of Real Nos is orthogonal. also. (Learn) Let A 5 unitary Mat formed by Real NOS Hem it is Real Mat also. Hoy () 4 @ we can conclude that $AA^{-}I$ which is condition of Orthor Mot if A is an orthogonal Mat they |A| = |ar| (Learn) w.k. that $AA^{-}I = |AA^{-}I| = |I| \Rightarrow |A| |A^{-}I| = |A| |A| = 1$









VECTORS & their Properties

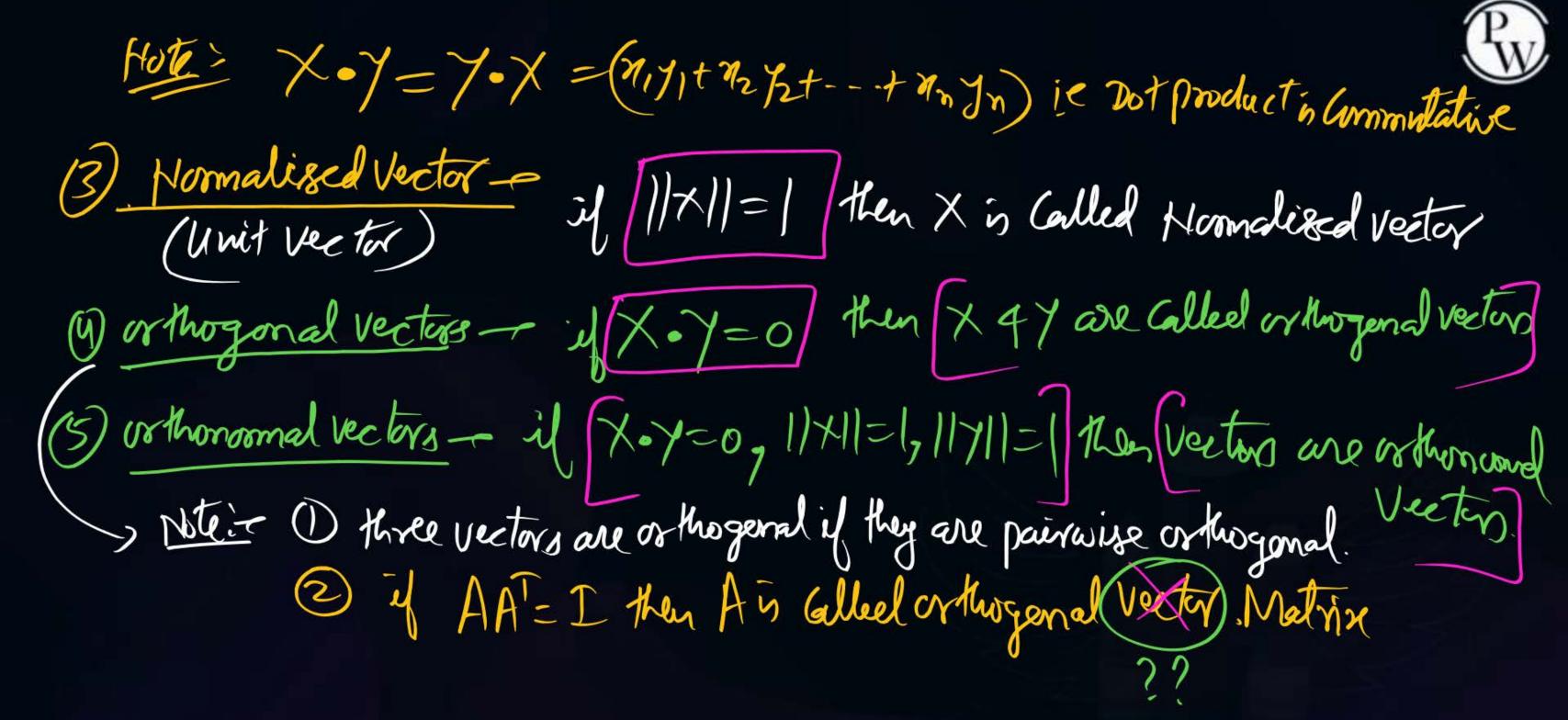


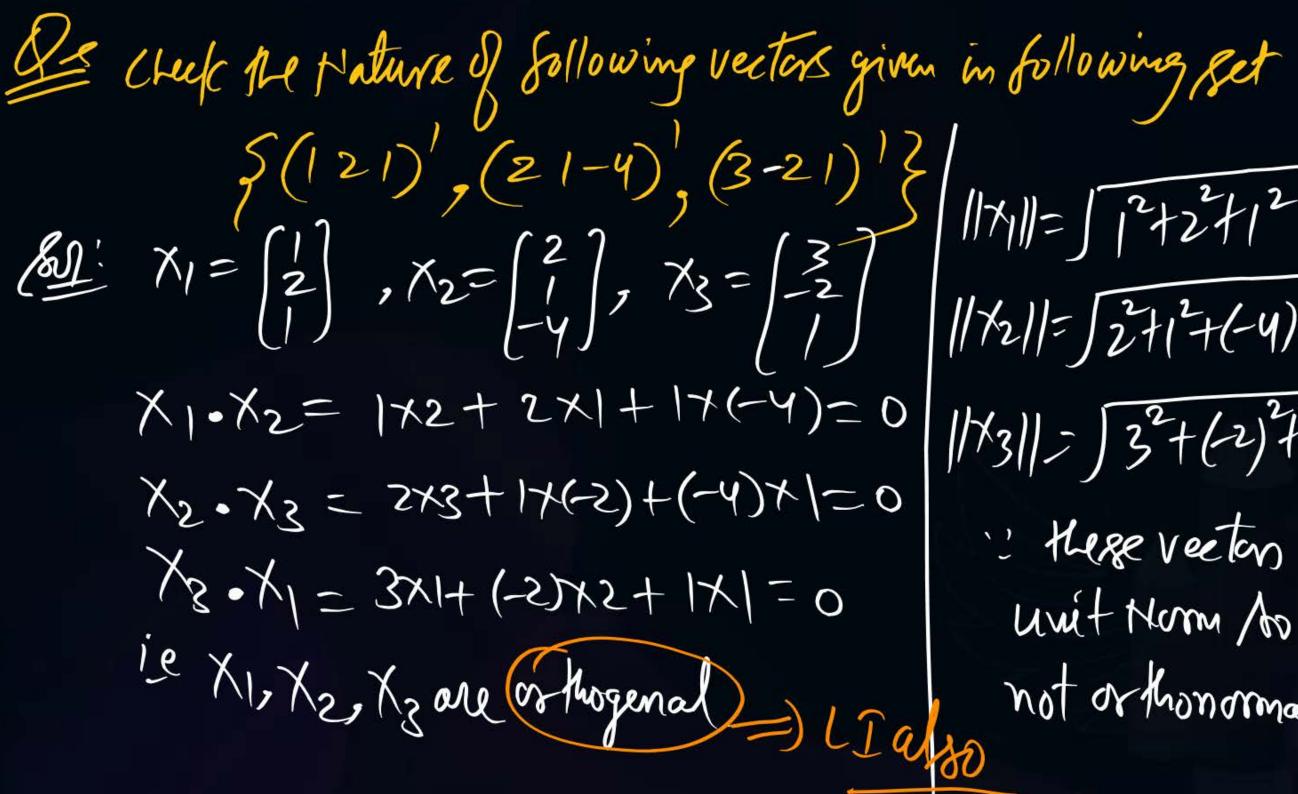
En-dim vector) Generally it is represented in the form of Column Matrin (But we can also represent it in the form of Row Mat) $\chi = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad \text{or} \quad \begin{bmatrix} x_1 & x_2 & x_3 - \cdots & x_n \\ x_1 & x_2 & x_3 - \cdots & x_n \end{bmatrix} | x y$ ie Azzy = Fr han 3 Row Vectors & 4 Glumn vectors

Comes de $\chi = \begin{cases} n_1 \\ n_2 \\ n_3 \end{cases}$ / $f = \begin{cases} 3/2 \\ 3/3 \end{cases}$ Hen $\begin{cases} n_1 \\ n_2 \end{cases}$ 1) Dot product - - X - Y = X - Y = (x/y/+ nz/z+nz/z+--+ nn/yn) Prof: X. Y= [x1 x2 x3--xn] [32] = [(x1x1+x2x2+--+xnxn)] [x]

Note-e Ty to Calculate X y=? = X = ND

mx (tox) 2) Norm of Vector= [1] x11 - [xxx =] x2+x2+x2+--+xn2
(Lungth)







||7/1 = \int 12+2+12 = \int 6 1/2/1= 52+12+(-4)2= j2 1/31/5 /32+(-2)2+1=5/4 "! Here vectors are not of unit Horm to they are not orthonormal.

TWO GAJAB KI PROPERTIES -



Column vectors of an orthogonal Matrin we prihonormal vectors ??

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2) If (vectors are orthogonal) Then (these are L.I also.) (T)

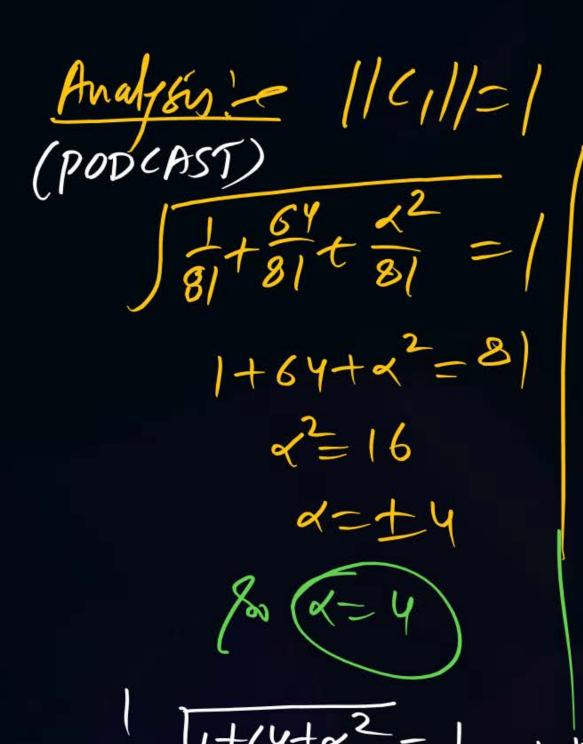


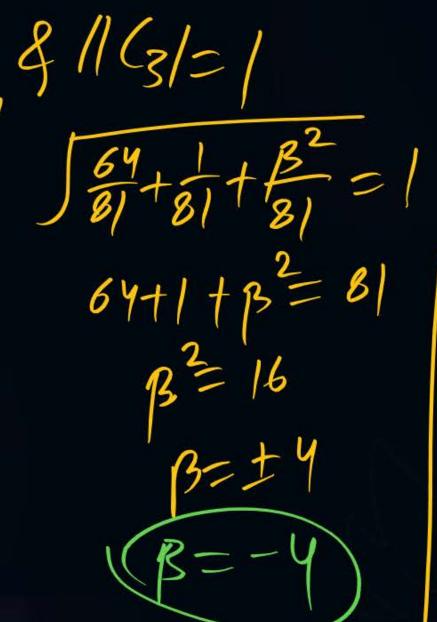
$$\frac{1}{81} \left(-4 + 32 - 74 \right) = 0$$

$$28 - 74 = 0$$

$$(4 = 4)$$

$$30.63=0$$
 $-32+4-7\beta=0$
 $-28-7\beta=0$
 $-28-7\beta=0$
 $-28-7\beta=0$

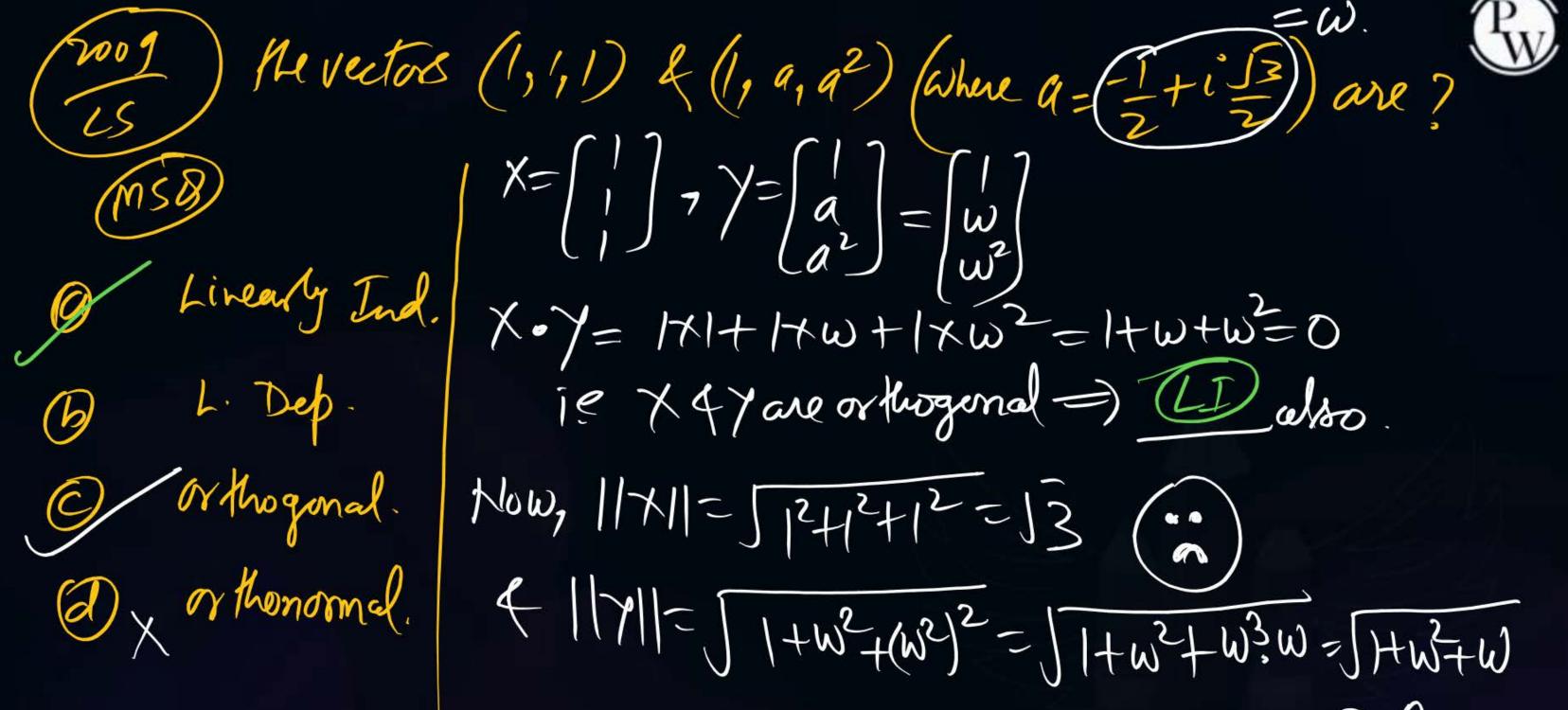






matrix =
$$||C_1|| = ||S_1||(3| = ||S_2||)$$

 $||S_3| + ||S_3|| + ||S_2|| = ||S_3| + ||S_3|| + ||S_3|| = ||S_3|| + ||S_3|| + ||S_3|| = ||S_3|| + ||$



4 1/11-5 1+w2+(w2)2-5 1+w2+w3;w=5+w3+w

