



NAME:
HABIB ID:

LINEAR ALGEBRA

SPRING 2024

QUIZ 1

Max Marks: 10

Time: 8 minutes

Q. 1 If A and B are two square matrices of the same size, then find the condition such that $(A + B)^2 = A^2 + B^2 + 2 A B$. [4]

Q. 2 Show that if A is an $r \times s$ matrix, and $A(BA)$ is defined, then B is an $s \times r$ matrix. [6]



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QUIZ 1 L1

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Q. 1 Find the augmented matrix for the following system of linear equations: [3]

$$\begin{aligned} 3x - 2z &= 2 \\ 2x + y - 5z &= -2 \\ -5y + z &= 3 \end{aligned}$$

Q. 2 Let $D = \text{diag}(d_1, d_2, \dots, d_m)$, and A is an $m \times n$ matrix. By showing appropriate derivation/working, find the rule for pre-multiplication of A by matrix D . [7]



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QUIZ 1 SOLUTIONS
VER 1 (1:15 – 2:30)

Q 1

SOLUTION: $(A+B)^2$
 $= (A+B)(A+B) = A^2 + \underline{AB+BA} + B^2$
 IF \boxed{A} AND \boxed{B} COMMUTE THEN
 $\underline{AB=BA}$
 $\therefore (A+B)^2 = A^2 + 2AB + B^2$

Q 2 For defining $A(BA)$, one should define BA first, and if BA is defined, it means a column of B is equal to rows of A , and as A is $r \times s$, then BA must be $t \times s$. Now for $A(BA)$, number of columns of A (s) should be equal to number of rows BA (t), which means $A(BA)$ must have resulting size $r \times s$. As a result, B is a $s \times r$ matrix

VER 2 (3:30 – 4:45)

Q 1 $\begin{bmatrix} 3 & 0 & -2 & 2 \\ 2 & 1 & -5 & -2 \\ 0 & -5 & 1 & 3 \end{bmatrix}$

Q 2

① IF \boxed{A} IS $m \times n$ MATRIX AND
 \boxed{D} IS A DIAGONAL MATRIX OF
 OF ORDER \boxed{m} THEN FIND THE
MULTIPLICATION RULE FOR \boxed{DA} .

SOLUTION: DA

$$= \begin{bmatrix} d_1 & 0 & \dots & 0 \\ 0 & d_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & \dots & d_m \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix}$$

$$= \begin{bmatrix} d_1 a_{11} & d_1 a_{12} & \dots & d_1 a_{1n} \\ d_2 a_{21} & d_2 a_{22} & \dots & d_2 a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ d_m a_{m1} & d_m a_{m2} & \dots & d_m a_{mn} \end{bmatrix}$$

10/ $\therefore \boxed{DA}$ IS OBTAINED BY MULTIPLYING $\boxed{d_1}$ WITH FIRST ROW OF \boxed{A} , $\boxed{d_2}$ WITH SECOND ROW OF \boxed{A} , AND FINALLY $\boxed{d_m}$ WITH mth ROW OF \boxed{A} .