QUIZ 2

Show your work not just your final answer

(1) Define two matrices

$$A = \begin{pmatrix} 5 & 2 \\ -1 & 3 \end{pmatrix}; \qquad B = \begin{pmatrix} 2 & 1 \\ -4 & 0 \end{pmatrix};$$

Compute $AB - BA$.

(2) Consider the 1×4 matrix,

$$C = \begin{bmatrix} 1 & 2 & -1 & -2 \end{bmatrix}$$

Compute CC^T.

(3) Find the inverse of the following matrix, if it exists:

$$\begin{bmatrix} 2 & 7 \\ 3 & 11 \end{bmatrix}$$

(4) Find an invertible 2×2 matrix A such that $A + A^T$ is singular.

(5) For what value of k is the following matrix singular:

$$\begin{bmatrix} 2 & 8 \\ k & -7 \end{bmatrix}$$

(6) The 2×2 elementary matrix E can be obtained from the identity using the row operation $R_2 = R_2 + 3R_1$. Find EA if

$$A = \begin{bmatrix} -8 & -1 \\ 1 & 8 \end{bmatrix}$$

(7) Find the LU factorization of the following matrix. No row interchanges should be made.

$$A = \begin{bmatrix} 2 & -2 & -1 \\ 8 & -9 & -6 \\ 10 & -7 & 5 \end{bmatrix}$$

(8) Use the following LU factorization to find all solutions to $A\mathbf{x} = \mathbf{b}$:

$$A = LU = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 5 & -1 & 1 \end{bmatrix} \begin{bmatrix} 4 & -2 \\ 0 & -9 \\ 0 & 0 \end{bmatrix}; \qquad \mathbf{b} = \begin{bmatrix} -42 \\ -189 \\ -147 \end{bmatrix}.$$

(9) Find the rank and nullity of the following matrix:

$$A = \begin{bmatrix} 2 & -6 & -4 & 1 & 2 \\ 1 & -3 & -3 & -2 & 2 \\ -1 & 3 & 2 & 0 & 0 \end{bmatrix}$$

(10) Let A be a 12×17 matrix with rank 5. Find the nullity of A.

(11) Find the determinant of the following matrix:

$$A = \begin{bmatrix} 2 & 0 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 & 0 \\ 2 & -6 & -4 & 0 & 0 \\ 1 & -3 & -3 & -1 & 0 \\ -1 & 5 & 12 & 0 & 3 \end{bmatrix}$$

(12) Use expansion by minors to find the determinant of the following matrix:

$$A = \begin{bmatrix} 2 & 0 & 1 & 0 \\ 2 & 1 & 0 & 0 \\ 2 & -6 & 0 & 0 \\ -1 & 5 & 0 & 3 \end{bmatrix}$$