Quiz #4

MATH 237 — Linear Algebra I
Thursday, Sept 17

Please print your name:

Problem 1. Consider the matrices

$$A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 3 \\ -1 & 2 \end{bmatrix}.$$

(a) Calculate AB.

(b) Calculate A^TA.

Solution.

(a) $AB = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 0 & 3 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} -2 & 7 \\ -1 & 2 \\ 0 & 3 \end{bmatrix}$

(b) $A^TA = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 2 & 5 \end{bmatrix}$

□

Problem 2. (Bonus!) For a small bonus, come up with two matrices A and B such that $AB = 0$ but neither A nor B is a zero matrix.

Solution. For instance, $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$. □

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