QUIZ 2 SOLUTION

ALEXANDER J STATHIS

1. Given the matrices

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & -1 & 2 \\ -1 & 2 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} -5 & 1 & 7 \\ -6 & 1 & 10 \\ 7 & -1 & -9 \end{pmatrix},$$

determine the following:

i Find A^T;
ii Find AB;
iii Find $2A - B$;
iv Is B an inverse of A?;
v Is A symmetric? Is AB symmetric?

Solution.

i The transpose of A is the matrix

$$\begin{pmatrix} 1 & 4 & -1 \\ 2 & -1 & 2 \\ 3 & 2 & 1 \end{pmatrix}.$$

ii The product is

$$AB = \begin{pmatrix} 1 & 2 & 3 \\ 4 & -1 & 2 \\ -1 & 2 & 1 \end{pmatrix} \begin{pmatrix} -5 & 1 & 7 \\ -6 & 1 & 10 \\ 7 & -1 & -9 \end{pmatrix} = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{pmatrix}.$$

iii The difference

$$2A - B = \begin{pmatrix} 2 & 4 & 6 \\ 8 & -2 & 4 \\ -2 & 4 & 2 \end{pmatrix} - \begin{pmatrix} -5 & 1 & 7 \\ -6 & 1 & 10 \\ 7 & -1 & -9 \end{pmatrix} = \begin{pmatrix} 7 & 3 & -1 \\ 14 & -3 & -6 \\ -9 & 5 & 11 \end{pmatrix}.$$

iv I assume we mean a two-sided inverse. In this case, the answer is clearly no, as it suffices to note that $AB \neq I$.

v A is not symmetric, as $a_{12} \neq a_{21}$. AB is symmetric, however, as $ab_{ij} = ab_{ji}$ for all $1 \leq i, j \leq 3$.

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