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Quiz for June 1, 2006

Recall that the matrix A is called *symmetric* if $A^{\mathrm{T}} = A$.

Let A and B be 2×2 symmetric matrices. Does AB have to be a symmetric matrix? If "yes", then prove the statement. If "no", then give a counterexample.

ANSWER: NO! Let $A = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$. We see that A is a symmetrix matrix, and B is a symmetric matrix, but

$$AB = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 4 & 8 \end{bmatrix}$$

is not a symmetrix matrix.