Solution (#553) We have

$$AB = \begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} -2 & -1 \\ 4 & 2 \end{pmatrix} = \begin{pmatrix} 8-8 & -4+4 \\ -4+4 & -2+2 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}.$$

$$[BA]_{11} = \left[\begin{pmatrix} -2 & -1 \\ 4 & 2 \end{pmatrix} \begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix} \right]_{11} = -8 - 2 \neq 0,$$

and so $BA \neq 0_{22}$.