RJP-333 Find AB and BA

Following the "row times column" rule [text equation (6.2)], we find

$$AB = \begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} -1 & 4 \\ 0 & 2 \end{pmatrix} = \begin{pmatrix} 2(-1)-5(0) & 2\cdot 4-5\cdot 2 \\ -1(-1)+3\cdot 0 & -1\cdot 4+3\cdot 2 \end{pmatrix} = \begin{pmatrix} -2 & -2 \\ 1 & 2 \end{pmatrix}$$

$$BA = \begin{pmatrix} -1 & 4 \\ 0 & 2 \end{pmatrix}\begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} -6 & 17 \\ -2 & 6 \end{pmatrix}$$ Note that $AB \neq BA$.

Extra:

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

$$5A = 5\begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} 10 & -25 \\ -5 & 15 \end{pmatrix}$$ (Multiply every element by 5)

$$3B = 3\begin{pmatrix} -1 & 4 \\ 0 & 2 \end{pmatrix} = \begin{pmatrix} -3 & 12 \\ 0 & 6 \end{pmatrix}$$, **then:** $5A - 3B = \begin{pmatrix} 13 & -37 \\ -5 & 9 \end{pmatrix}$

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We cannot find AB because a row of A has 4 elements and a column of B has only 3. We can find BA because a row of B has 2 elements and a column of A has 2 elements. Multiplying "row times column", we get

$$BA = \begin{pmatrix} 2 & 4 \\ 1 & -1 \\ 3 & -1 \end{pmatrix}\begin{pmatrix} 2 & 3 & 1 & -4 \\ 2 & 1 & 0 & 5 \end{pmatrix} = \begin{pmatrix} 12 & 10 & 2 & 12 \\ 0 & 2 & 1 & -9 \\ 4 & 8 & 3 & -17 \end{pmatrix} .$$