Problem 1:

\[ A = \begin{pmatrix} 2 & 0 & -1 \\ 4 & -5 & 2 \end{pmatrix}, 
B = \begin{pmatrix} 7 & -5 & 1 \\ 1 & -4 & -3 \end{pmatrix}, 
C = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}, 
D = \begin{pmatrix} 3 & 5 \\ -1 & 4 \end{pmatrix} \]

then

\[ -2A = \begin{pmatrix} -4 & 0 & 2 \\ -8 & 10 & -4 \end{pmatrix} \]

\[ B - 2A = \begin{pmatrix} 3 & -5 & 3 \\ -7 & 6 & -7 \end{pmatrix} \]

\[ AC \text{ is not defined} \]

\[ CD = \begin{pmatrix} 1 & 13 \\ -7 & -6 \end{pmatrix} \]

Problem 9: If

\[ A = \begin{pmatrix} 2 & 5 \\ -3 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 4 & -5 \\ 3 & k \end{pmatrix} \]

What value of \( k \), if any will make \( AB = BA \)?

Well,

\[ AB = \begin{pmatrix} 23 & -10 + 5k \\ -9 & 15 + k \end{pmatrix} \]

and

\[ BA = \begin{pmatrix} 23 & 15 \\ 6 - 3k & 15 + k \end{pmatrix} \]

Recall two matrices are equal if the corresponding entries are equal.

So if there is a \( k \), it will have to satisfy these four equations:
\[
\begin{align*}
23 &= 23 \\
15 + k &= 15 + k \\
6 - 3k &= -9 \\
-10 + 5k &= 15
\end{align*}
\]

But clearly the first two are trivial equations, leaving us with these two:

\[
\begin{align*}
6 - 3k &= -9 \\
-10 + 5k &= 15
\end{align*}
\]

There is a unique solution, namely $k = 5$. So this means that there is exactly one value of $k$, namely $k = 5$ for which $AB = BA$. 

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