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 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:

$$\begin{aligned} 23 &= 23 \\ 15 + k &= 15 + k \\ 6 - 3k &= -9 \\ -10 + 5k &= 15 \end{aligned}$$

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

$$\begin{aligned} 6 - 3k &= -9 \\ -10 + 5k &= 15 \end{aligned}$$

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