Question
Let

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 3 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & -1 \\ 2 & -3 \\ 0 & -1 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 1 & 0 \\ 3 & -4 & 2 \end{pmatrix}.$$

Evaluate all possible products of pairs of the above matrices.

Answer
AA is undefined

$$AB = \begin{pmatrix} 5 & -10 \\ 10 & -15 \end{pmatrix}$$

$$AC = \begin{pmatrix} 14 & -9 & 7 \\ 16 & -1 & 8 \end{pmatrix}$$

$$BA = \begin{pmatrix} -3 & -1 & 1 \\ -10 & -5 & 0 \\ -4 & -3 & -2 \end{pmatrix}$$

BB, BC, CA are all undefined.

$$CB = \begin{pmatrix} 3 & -5 \\ 4 & -5 \\ -5 & 7 \end{pmatrix}$$

$$CC = \begin{pmatrix} 6 & -2 & 3 \\ 4 & 3 & 2 \\ 1 & -9 & 7 \end{pmatrix}$$