As seen

Q3 Let A be a symmetric matrix $= \begin{bmatrix} a & b \\ b & c \end{bmatrix}$ Ex. $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$

B be a symmetric matrix $= \begin{bmatrix} d & e \\ e & -d \end{bmatrix}$ Ex $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$

$AB = \begin{bmatrix} a & b \\ b & c \end{bmatrix} \begin{bmatrix} d & e \\ e & -d \end{bmatrix} = \begin{bmatrix} ad+be & ae-bd \\ bd+ce & be-cd \end{bmatrix}$ Ex $\begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$

$ae-bd \neq bd+ce$ ∴ the product of two symmetric matrices is not always symmetric

Ex $-2 \neq 2$