9강 보충강의

$$\begin{bmatrix} x_1 & x_2 \end{bmatrix}\begin{bmatrix} a_1 & a_3 \\ a_3 & a_2 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} a_1x_1^2 + a_2x_2^2 + 2a_3x_1x_2 \end{bmatrix}_{1\times 1}$$

$$\begin{bmatrix} x_1 & x_2 & x_3 \end{bmatrix}\begin{bmatrix} a_1 & a_4 & a_5 \\ a_4 & a_2 & a_6 \\ a_5 & a_6 & a_3 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$\begin{bmatrix} x_1 & x_2 \end{bmatrix}\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = a_{11}x_1^2 + a_{22}x_2^2 + a_{12}x_1x_2 + a_{21}x_1x_2$$

$$+ 2a_{12}x_1x_2$$

↳ 대칭행렬

$$\star \quad \begin{bmatrix} x_1 & x_2 & \cdots & x_n \end{bmatrix}\begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ \vdots & & & & \vdots \\ a_{n1} & a_{n2} & a_{n3} & \cdots & a_{nn} \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = a_{ij}x_jx_i \quad (i, j \in \{1 \sim n\})$$

pf) $\begin{bmatrix} x_1 & x_2 & \cdots & x_n \end{bmatrix}_{1\times n}\begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ \vdots & & & & \vdots \\ a_{n1} & a_{n2} & a_{n3} & \cdots & a_{nn} \end{bmatrix}_{n\times n} = \begin{bmatrix} \sum_{i=1}^{n} x_ia_{i1} & \sum_{i=1}^{n} x_ia_{i2} & \cdots & \sum_{i=1}^{n} x_ia_{in} \end{bmatrix}$

$$\begin{bmatrix} \sum_{i=1}^{n} x_ia_{i1} & \sum_{i=1}^{n} x_ia_{i2} & \cdots & \sum_{i=1}^{n} x_ia_{in} \end{bmatrix}_{1\times n}\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}_{n\times 1} = \begin{bmatrix} \quad \end{bmatrix}_{1\times 1}$$

$$= x_1\sum_{i=1}^{n} x_ia_{i1} + x_2\cdot\sum_{i=1}^{n} x_ia_{i2} + \cdots + x_n\cdot\sum_{i=1}^{n} x_ia_{in}$$

$a_{i1}x_1x_i$