

17) $\vec{a}, \vec{e} \in \mathbb{K}^n$

$$^t(\lambda \vec{a} + \mu \vec{e}) = \lambda ^t \vec{a} + \mu ^t \vec{e}$$

$$\textcircled{T_2} = ^t \begin{pmatrix} \vdots \\ \lambda a_i + \mu e_i \\ \vdots \end{pmatrix} = (\dots \lambda a_i + \mu e_i \dots)$$

$$= \lambda (\dots a_i \dots) + \mu (\dots e_i \dots)$$

$$= \lambda ^t \vec{a} + \mu ^t \vec{e} = \textcircled{T_2}$$

18)
$$\begin{vmatrix} a_1 & a_2 & a_3 \\ e_1 & e_2 & e_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & e_1 & c_1 \\ a_2 & e_2 & c_2 \\ a_3 & e_3 & c_3 \end{vmatrix}$$

$$\textcircled{T_2} = a_1 \begin{vmatrix} e_2 & e_3 \\ c_2 & c_3 \end{vmatrix} - e_1 \begin{vmatrix} a_2 & a_3 \\ c_2 & c_3 \end{vmatrix} + c_1 \begin{vmatrix} a_2 & a_3 \\ e_2 & e_3 \end{vmatrix}$$

$$= a_1 \begin{vmatrix} e_2 & c_2 \\ e_3 & c_3 \end{vmatrix} - e_1 (a_2 c_3 - c_2 a_3) + c_1 (a_2 e_3 - e_2 a_3)$$

$$= a_1 \begin{vmatrix} e_2 & c_2 \\ e_3 & c_3 \end{vmatrix} - a_2 (e_1 c_3 - e_3 c_1) + a_3 (e_1 c_2 - e_2 c_1)$$

$$= a_1 \begin{vmatrix} e_2 & c_2 \\ e_3 & c_3 \end{vmatrix} - a_2 \begin{vmatrix} e_1 & c_1 \\ e_3 & c_3 \end{vmatrix} + a_3 \begin{vmatrix} e_1 & c_1 \\ e_2 & e_2 \end{vmatrix}$$

$$= \begin{vmatrix} a_1 & e_1 & c_1 \\ a_2 & e_2 & c_2 \\ a_3 & e_3 & c_3 \end{vmatrix} = \textcircled{T_2}$$

13.11.17

(2)

$$1) \begin{vmatrix} a_1 & a_2 & a_3 \\ e_1 & e_2 & e_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \dots$$

2行と3行の交換は3倍の値になる

$$\begin{vmatrix} a_1 & a_2 & a_3 \\ e_1 & e_2 & e_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & e_1 & c_1 \\ a_2 & e_2 & c_2 \\ c_3 & e_3 & c_3 \end{vmatrix}$$

$$= -e_1 \begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix} + e_2 \begin{vmatrix} a_1 & c_1 \\ a_3 & c_3 \end{vmatrix} - e_3 \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$$

↑ 23行の交換

$$= -e_1 \begin{vmatrix} a_1 & a_3 \\ c_1 & c_3 \end{vmatrix} + e_2 \begin{vmatrix} a_1 & a_3 \\ c_1 & c_3 \end{vmatrix} - e_3 \begin{vmatrix} a_1 & a_2 \\ c_1 & c_2 \end{vmatrix}$$

$$\begin{vmatrix} a_1 & a_2 & a_3 \\ e_1 & e_2 & e_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & e_1 & c_1 \\ a_2 & e_2 & c_2 \\ a_3 & e_3 & c_3 \end{vmatrix}$$

↑ 33行の交換

$$= c_1 \begin{vmatrix} a_1 & e_1 \\ a_2 & e_2 \end{vmatrix} - c_2 \begin{vmatrix} a_2 & e_2 \\ a_3 & e_3 \end{vmatrix} + c_3 \begin{vmatrix} a_1 & e_1 \\ a_2 & e_2 \end{vmatrix}$$

$$= c_1 \begin{vmatrix} a_1 & a_2 \\ e_1 & e_2 \end{vmatrix} - c_2 \begin{vmatrix} a_2 & a_3 \\ e_2 & e_3 \end{vmatrix} + c_3 \begin{vmatrix} a_1 & a_2 \\ e_1 & e_2 \end{vmatrix}$$