$\Rightarrow$ Symmetric Matrix $\Rightarrow$ $A^T = A$
Skew symmetric matrix $\Rightarrow$ $A^T = -A$

$\Rightarrow$ $(AB)^T = B^T A^T$
$(AB)^{-1} = B^{-1} A^{-1}$
$\text{adj}(AB) = \text{adj}\,B \cdot \text{adj}\,A$

$\Rightarrow$ $(A^n)^T = (A^T)^n$ $\quad (n \in N)$
$(A^n)^{-1} = (A^{-1})^n$
$\text{adj}(A^n) = (\text{adj}\,A)^n$

$\Rightarrow$ $(A^T)^{-1} = (A^{-1})^T$
$\text{adj}(A^T) = (\text{adj}\,A)^T$

$\Rightarrow$ $|A| = |A^T|$
$|A^n| = |A|^n$
$|AB| = |A||B|$
$|A^{-1}| = \dfrac{1}{|A|}$

$\Rightarrow$ $|\lambda A| = \lambda^n |A|$ $\quad$ ($n \rightarrow$ order of matrix)

$\Rightarrow$ $\text{adj}(\lambda A) = \lambda^{n-1}\,\text{adj}\,A$ $\quad$ ($n \rightarrow$ order of matrix)
$(\lambda A)^{-1} = \dfrac{1}{\lambda} A^{-1}$

$\Rightarrow$ $A \cdot \text{adj}\,A = |A|\, I = \text{adj}\,A \cdot A$

$$\left\{ A^{-1} = \frac{\text{adj}\,A}{|A|}, \quad (\text{adj}\,A)^{-1} = \frac{A}{|A|} \right\}$$

$$|\underbrace{\text{adj}(\text{adj}(\text{adj} \ldots \text{adj}\,A))))}_{k \text{ times}}| = |A|^{(n-1)^k}$$

$n \rightarrow$ order of matrix

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⇒ Any matrix 'A' can be represented as sum of a symmetric & skew symmetric matrix.

$$A = \underbrace{\frac{A+A'}{2}}_{\text{Symmetric}} + \underbrace{\frac{A-A'}{2}}_{\text{Skew-symmetric}}$$

⇒ Determinant of odd order skew symmetric matrix is zero.

⇒ If we interchange consecutive rows/columns in determinant, it is multiplied by -1. If total 'm' "consecutive rows/colums interchange" occur then determinant will be multiplied by $(-1)^m$.

Ex. $\begin{vmatrix} R_1 \\ R_2 \\ R_3 \end{vmatrix} = -\begin{vmatrix} R_2 \\ R_1 \\ R_3 \end{vmatrix} = (-1)^2 \begin{vmatrix} R_2 \\ R_3 \\ R_1 \end{vmatrix}$

$= \begin{vmatrix} R_2 \\ R_3 \\ R_1 \end{vmatrix}$