Th:→ If A be any n-rowed square matrix, then

$$(\text{Adj } A)A = A(\text{Adj } A) = |A| I_n$$

Proof:→ let $A = [a_{ij}]_{n\times n}$ be any ~~[redacted]~~ square matrix

let $\text{Adj } A = [b_{ij}]_{n\times n}$

Then $b_{ij} = A_{ji}$ = co-factor of a_{ji} in $|A|$. —(1)

Since the matrices A & $\text{Adj } A$ are both $n\times n$ square matrix, therefore both products $A(\text{Adj}A)$ & $(\text{Adj } A)\cdot A$ exist and also of $n\times n$.

Also, the $(i,j)^{th}$ element of $A(\text{Adj}A)$

$$= \sum_{k=1}^{n} a_{ik} b_{kj} \quad \{\text{by def}^n \text{ of Product of two matrices}\}$$

$$= \sum_{k=1}^{n} a_{ik} A_{jk} \quad \{\text{from (1)}\}$$

$$= 0 \text{ or } |A| \text{ according as } i \neq j \text{ or } i = j$$

Hence the $(i,j)^{th}$ element of $A(\text{Adj}A) = |A|$ if $i=j$ & $= 0$ if $i \neq j$.

Therefore
$$A(\text{Adj}A) = \begin{bmatrix} |A| & 0 & 0 & 0 & \cdots & 0 \\ 0 & |A| & 0 & 0 & \cdots & 0 \\ \vdots & & & & & \\ 0 & 0 & 0 & 0 & \cdots & |A| \end{bmatrix}$$

$$\boxed{A(\text{Adj}A) = |A| I_n}$$