Power of a Square Matrix

- If $A = \text{diag}\,.\,(a_1, a_2, \cdots, a_n)$, then $A^k = \text{diag}\,.\left({a_1}^k,\ {a_2}^k, \cdots,\ {a_n}^k\right)$

Proof: Let $A = \text{diag}\,.\,(a_1, a_2, a_3) = \begin{pmatrix} a_1 & 0 & 0 \\ 0 & a_2 & 0 \\ 0 & 0 & a_3 \end{pmatrix}$

$$A^2 = \begin{pmatrix} a_1 & 0 \ \ldots & ..0 \\ 0 & a_2 \ \ldots & ..0 \\ \vdots & \vdots & \vdots \\ 0 & 0 \ \ldots & ..a_n \end{pmatrix} \begin{pmatrix} a_1 & 0 \ \ldots & ..0 \\ 0 & a_2 \ \ldots & ..0 \\ \vdots & \vdots & \vdots \\ 0 & 0 \ \ldots & ..a_n \end{pmatrix} = \begin{pmatrix} a_1^2 & 0 \ \ldots & ..0 \\ 0 & {a_2}^2 \ \ldots & ..0 \\ \vdots & \vdots & \vdots \\ 0 & 0 \ \ldots & ..{a_n}^2 \end{pmatrix}$$

$$\Rightarrow A^k = \begin{pmatrix} a_1^k & 0 \ \ldots & ..0 \\ 0 & {a_2}^k \ \ldots & ..0 \\ \vdots & \vdots & \vdots \\ 0 & 0 \ \ldots & ..{a_n}^k \end{pmatrix}$$

- $I^k = I$, where I is identity matrix of order n .

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