Key Takeaways

Properties of Determinants

- If $A = [a_{ij}]_n$, then $\boxed{|kA| = k^n|A|}$ where k is a scalar.

Example:

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \quad kA = \begin{bmatrix} ka_{11} & ka_{12} & ka_{13} \\ ka_{21} & ka_{22} & ka_{23} \\ ka_{31} & ka_{32} & ka_{33} \end{bmatrix}$$

$$\Rightarrow |kA| = k^3 \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} \Rightarrow |kA| = k^3|A|$$

- If $A = [a_{ij}]_n, B = [b_{ij}]_n$, then $|AB| = |A||B|$

$$|A^k| = |A|^k$$

$$\Rightarrow \underbrace{|A \cdot A \cdot A \cdots A|}_{k \text{ times}} = \underbrace{|A| \cdot |A| \cdot |A| \cdots |A|}_{k \text{ times}} = |A|^k$$

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