Invertible Matrices – Quick Revision

- Definition: An m×m (square) matrix A is said to be **invertible** if there exists another square matrix B such that $BA = AB = I_m$ (m×m identity matrix). B is said to be an **inverse** of A.
  - Another terminology: Invertible matrices are also called **nonsingular.** Matrices which are not invertible are said to be **singular**.
  - **Observation 1**: The inverse of A if it exists is unique, notation A^{-1}.
  - **Observation 2**: If A is invertible, then so is A^{-1} and $(A^{-1})^{-1} = A$.

    Observation 3: If A and B are invertible, so is AB, and $(AB)^{-1} = B^{-1} A^{-1}$**.**
  - **Observation 4 (Generalization of 3)**: The product of invertible matrices is invertible, and the inverse is the product of the inverses taken in reverse order. In other words, if $A_1, A_2, \ldots, A_n$, $(n \geq 2)$, are invertible matrices, then $C = A_1A_2\ldots A_n$ is an invertible matrix, and $C^{-1} = A_n^{-1} \ldots A_2^{-1} A_1^{-1}$.

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- **Remark:** It will be assumed that you are already aware of the definition on the previous slide, and the four properties of invertible matrices stated there. We will not present any proofs of these, but will use them without further explanation from now onward. As a preliminary exercise, you can try to construct you own proofs (*they are quite easy*).