Examples

\[ \det(A) = \det(A^t) \]
Inverse of a matrix

Let $A$ be a square matrix of size $n$.

If $|A| \neq 0$, then $A$ is a non-singular matrix and there exists an $n \times n$ matrix, denoted $A^{-1}$, such that $AA^{-1} = I_n$.

$A^{-1}$ is unique.

For a $2 \times 2$ matrix, the inverse is calculated as follows.

Let us assume that $|A| \neq 0$. Then,

$$AA^{-1} = A^{-1}A = I_2$$

$$(A^{-1})^{-1} = A.$$ 

For larger square matrices, finding the inverse is significantly more complex.
Elementary row operations

Any nonsingular square matrix can be reduced to an identity matrix using elementary row operations.
Gauss-Jordan elimination method to find the inverse of a matrix

Use elementary row operations to reduce the left half of the augmented matrix to identity matrix.

The right half of the resulting augmented matrix is the inverse of the original matrix.
Example

Check:
Gauss-Jordan Elimination Method

If the diagonal element of the current row, the element \((i, i)\) position in iteration \(i\), is 0, switch that row with another row that has nonzero value in that column position. For invertible matrices, this is always feasible.
Let \( A = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 7 & 10 & 3 \end{pmatrix} \)

What is the determinate of \( A \)?
Solution to system of Linear equations

**Note**: If the equations are independent, that is, none of the equations can be obtained by a linear combination of the other two equations, then the corresponding matrix is nonsingular.