**Important Things to know before the lecture:**

In the Gaussian elimination and its extended versions method for solving systems of linear equations, specific row operations are used to transform the matrix into an upper triangular form or row echelon form. These operations are fundamental to the process and are designed to preserve the system’s solutions.

**Permissible Row Operations**

1. **Swapping Rows**: You can interchange two rows. This operation does not change the solution set of the system.
2. **Multiplying a Row by a Non-zero Scalar**: Any row can be multiplied by a non-zero constant. This operation changes the scale of the equation but not its solutions.
3. **Adding a Multiple of One Row to Another**: You can add or subtract a multiple of one row to another row. This operation is used to create zeros in specific positions under the pivot elements.

**Operations Not Permissible**

* **Multiplying or Adding Rows with Columns**: Operations involving both rows and columns simultaneously are not allowed, as they would change the nature of the system.
* **Multiplying a Row by Zero**: This operation is not allowed as it leads to loss of information from the equation, potentially changing the solution set.
* **Changing the Number of Rows or Columns**: Any operation that alters the dimensions of the matrix (like adding or removing a row or column) is not permissible, as it would change the underlying system of equations.

**Importance of Following Permissible Operations**

The key purpose of these operations in Gaussian elimination is to systematically simplify the matrix while ensuring that the transformed matrix represents a system of equations equivalent to the original. This means that the operations should neither alter the solution set nor introduce any new solutions. Adhering to the permissible operations guarantees that the integrity of the system is maintained throughout the process.