Here's an overview of different types of matrices, including definitions and examples:

1. Row Matrix

- **Definition**: A matrix with only one row.
- **Example**: $A = [2, -3, 5]$ (1 row, 3 columns)

2. Column Matrix

- **Definition**: A matrix with only one column.
- **Example**: $B = \begin{bmatrix} 4 \\ -1 \\ 3 \end{bmatrix}$ (3 rows, 1 column)

3. Square Matrix

- **Definition**: A matrix with the same number of rows and columns.
- **Example**: $C = \begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix}$ (2x2)

4. Diagonal Matrix

- **Definition**: A square matrix in which all elements except those on the main diagonal are zero.
- **Example**: $D = \begin{bmatrix} 5 & 0 \\ 0 & -3 \end{bmatrix}$

5. Scalar Matrix

- **Definition**: A diagonal matrix in which all diagonal elements are the same.
- **Example**: $E = \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

6. Identity Matrix

- **Definition**: A square matrix with 1's on the main diagonal and 0's elsewhere.
- **Example**: $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

7. Zero or Null Matrix

- **Definition**: A matrix in which all elements are zero.
- **Example**: $O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

8. Upper Triangular Matrix

- **Definition**: A square matrix where all elements below the main diagonal are zero.
- **Example**: $U = \begin{bmatrix} 2 & 3 & 1 \\ 0 & -1 & 4 \\ 0 & 0 & 5 \end{bmatrix}$

9. Lower Triangular Matrix

- **Definition**: A square matrix where all elements above the main diagonal are zero.
- **Example**: $L = \begin{bmatrix} 3 & 0 & 0 \\ 4 & 5 & 0 \\ 1 & -2 & 6 \end{bmatrix}$

10. Symmetric Matrix

- **Definition**: A square matrix that is equal to its transpose (i.e., $A = A^T$).
- **Example**: $S = \begin{bmatrix} 2 & 4 \\ 4 & 3 \end{bmatrix}$

11. Skew-Symmetric Matrix

- **Definition**: A square matrix that satisfies $A = -A^T$, meaning the diagonal elements are zero, and the other elements are negatives of each other.
- **Example**: $K = \begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$

12. Hermitian Matrix

- **Definition**: A complex square matrix that is equal to its conjugate transpose (i.e., $A = A^H$, where A^H is the transpose with complex conjugates).
- **Example**: $H = \begin{bmatrix} 3 & 2+i \\ 2-i & 5 \end{bmatrix}$

13. Orthogonal Matrix

- **Definition**: A square matrix whose rows and columns are orthogonal unit vectors, satisfying $A \cdot A^T = I$.
- **Example**: $O = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$

14. Idempotent Matrix

- **Definition**: A matrix that, when multiplied by itself, yields the same matrix (i.e., $A \cdot A = A$).
- **Example**: $I_d = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

15. Involutory Matrix

- **Definition**: A matrix that is its own inverse (i.e., $A \cdot A = I$).

- **Example**: $N = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

These types of matrices each serve unique roles in mathematical applications, from solving equations to representing transformations in various fields such as physics, computer graphics, and statistics.