Matrices - Important Topics

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Rank of a Matrix

The rank of a matrix is the maximum number of linearly independent row or column vectors in the matrix. It determines the dimension of the column space.
Formula: Rank(A) = number of nonzero rows in its row echelon form.

Systems of Linear Equations

A system of linear equations consists of multiple linear equations involving the same set of variables.
Solution methods: Gaussian elimination, Cramer's Rule, Matrix inversion method.

Characteristic Equation

The characteristic equation of a square matrix A is given by $\det(A - \lambda I) = 0$, where λ represents the eigenvalues of A.

Cayley-Hamilton Theorem

This theorem states that every square matrix satisfies its own characteristic equation.

Eigenvalues and Eigenvectors

For a square matrix A, an eigenvector v and its corresponding eigenvalue λ satisfy $Av = \lambda v$.

Diagonalization of Matrices

A matrix A is diagonalizable if there exists an invertible matrix P such that $P^{-1}AP$ is a diagonal matrix.