Let $A$ and $D$ be $n \times n$ matrices.

Let $L : V \to V$ be a linear operator on an $n$-dimensional vector space $V$.

Recall that $A$ and $D$ are similar matrices if and only if there exists a nonsingular matrix $P$ such that $D = P^{-1}AP$ if and only if $A$ and $D$ represent $L$ with respect to two bases for $V$.

The linear operator $L$ is diagonalizable if there exists a basis $S$ for $V$ such that $L$ is represented with respect to $S$ by a diagonal matrix $D$.

If $A$ is similar to a diagonal matrix, then $A$ is diagonalizable.

**Theorem 1** Similar matrices have the same eigenvalues.

**Theorem 2** The linear operator $L$ is diagonalizable if and only if $V$ has a basis $S$ of eigenvectors of $L$. If $D$ is the diagonal matrix representing $L$ with respect to $S$, then the entries on the main diagonal of $D$ are the eigenvalues of $L$.

**Theorem 3** The matrix $A$ is similar to a diagonal matrix $D$ if and only if $A$ has $n$ linearly independent eigenvectors. The elements on the main diagonal of $D$ are the eigenvalues of $A$.

**Theorem 4** If the roots of the characteristic polynomial of $A$ are all distinct, then $A$ is diagonalizable.