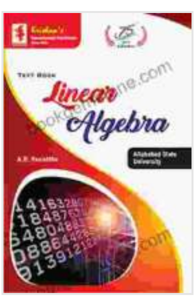
Tb Linear Algebra Edition 15b Pages 296 Code 1413 Concept Theorems Derivation

Tb Linear Algebra Edition 15b is a widely-used textbook for undergraduate linear algebra courses. It provides a comprehensive to the subject, covering a wide range of topics, including matrix theory, vector spaces, eigenvalues, and eigenvectors.

Pages 296 of the textbook contain a discussion of the concept of linear independence. Linear independence is a fundamental concept in linear algebra that determines whether a set of vectors can be expressed as a linear combination of other vectors in the set.

Code 1413 on pages 296 refers to a theorem that provides a necessary and sufficient condition for a set of vectors to be linearly independent. This theorem is known as the Linear Independence Theorem.



TB Linear Algebra I Edition-15B I Pages-296 I Code-1413 IConcept+ Theorems/Derivation + Solved Numericals + Practice Exercise I Text Book (Mathematics 45) by A.R Vasishtha

4.7 out of 5

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X-Ray for textbooks	: Enabled

The Linear Independence Theorem states that a set of vectors is linearly independent if and only if the only solution to the equation

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

is the trivial solution, where c_1, c_2, ..., cn are scalars.

In other words, a set of vectors is linearly independent if and only if none of the vectors can be expressed as a linear combination of the other vectors in the set.

The proof of the Linear Independence Theorem can be divided into two parts.

Part 1: If a set of vectors is linearly independent, then the only solution to the equation

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

is the trivial solution.

Proof: Assume that a set of vectors is linearly independent. Then, for any set of scalars c_1, c_2, ..., cn, if

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

then $c_1 = c_2 = ... = cn = 0$.

To prove this, suppose that $c_1 \neq 0$. Then, we can divide both sides of the equation by c_1 to obtain

$v_1 + (c_2/c_1)v_2 + ... + (cn/c_1)vn = 0$

which contradicts the assumption that the set of vectors is linearly independent. Therefore, c_1 must be 0.

By a similar argument, we can show that c_2, ..., cn must also be 0. Therefore, the only solution to the equation

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

is the trivial solution.

Part 2: If the only solution to the equation

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

is the trivial solution, then the set of vectors is linearly independent.

Proof: Assume that the only solution to the equation

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

is the trivial solution. Then, for any set of scalars c_1, c_2, ..., cn, if

$c_1v_1 + c_2v_2 + ... + cnvn = 0$

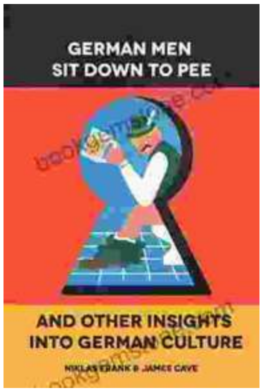
then $c_1 = c_2 = ... = cn = 0$.

This implies that none of the vectors can be expressed as a linear combination of the other vectors in the set. Therefore, the set of vectors is linearly independent.

The Linear Independence Theorem has a number of important applications in linear algebra. For example, it can be used to:

- Determine whether a set of vectors is a basis for a vector space.
- Find the dimension of a vector space.
- Solve systems of linear equations.
- Diagonalize matrices.

The Linear Independence Theorem is a fundamental theorem in linear algebra that provides a necessary and sufficient condition for a set of vectors to be linearly independent. This theorem has a number of important applications in linear algebra, and it is essential for understanding the subject.



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