Linear Algebra, Chapter 3 Study Guide  
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The following is a list of topics covered in Chapter 3 of Fraleigh and Beauregard’s *Linear Algebra*. Test questions will be chosen directly from the text. This list is not meant to be comprehensive, but gives a list of several important topics. I reserve the right to ask you definitions and theorems on the tests. If I do so, then I will choose from the **bold-faced** items below.

**Chapter 3. Vector Spaces.**

3-1. Vector Spaces. **vector Space** (Definition 3.1), additive identity, additive inverse, examples of vector spaces other than $\mathbb{R}^n$ (Examples 3.1.2, 3.1.3, Exercise 6,), **Elementary Properties of Vector Spaces** (Theorem 3.1), universality of function spaces.

3-2. Basic Concepts of Vector Spaces. **linear combination** (Definition 3.2), **span/finitely generated** (Definition 3.3), **subspace** (Definition 3.4), **Test for Subspace** (Theorem 3.2), some subspaces of $\mathcal{F}$ (Note 3.2.A), **dependence relation/linearly dependent/linearly independent** (Definition 3.5), **basis** (Definition 3.6), **Unique Combination Criterion for a Basis** (Theorem 3.3), finitely generated vector space, **Relative Size of Spanning and Independent Sets** (Theorem 3.4), **Invariance of Dimension for Finitely Generated Spaces** (Corollary 3.2.A), **dimension** of a vector space (Definition 3.7), Corollary 3.2.B concerning bases and independent sets in an $n$-dimensional vector space.

3-3. Coordinatization of Vectors. **ordered basis**, coordinate vector relative to an ordered basis (Definition 3.8), finding a coordinate vector (Note 3.3.A), **one to one** and **onto** functions, **isomorphism**, **The Fundamental Theorem of Finite Dimensional Vector Spaces** (Theorem 3.3.A).

3-4. Linear Transformations. **linear transformation** (Definition 3.9), **domain/codomain**, image, range, inverse image, kernel, **composite transformation**, Preservation of Zero and Subtraction (Theorem 3.5), Bases and Linear Transformations (Theorem 3.6), **Preservation of Subspaces** (Theorem 3.7), **one-to-one transformation**, **onto transformation**, One-to-One
and Kernel (Corollary 3.4.A), inverse transformation, Theorem 3.8, Coor-
dinatization of Finite-Dimensional Spaces (Theorem 3.9), Matrix Representa-
tions of Linear Transformations (Theorem 3.10), matrix representation of a
linear transformation relative to two bases (Definition 3.11) and the matrix
representation of the inverse transformation (Theorem 3.4.B).

3-5. Inner-Product Spaces. inner product and inner-product space (Defi-
nition 3.12), norm, distance, Schwarz Inequality (Theorem 3.11), Triangle
Inequality, angle between vectors, orthogonal vectors.