

The functional analysis I

1. Introduction: ((linear spaces, Convex set. metric spaces , pseudo metric space , contractive mapping, equivalent metric spaces, product metric spaces, relatively metric space ,sequence in metric space, series in metric space, complete metric space))

2. Normed Linear Spaces: ((Definition, Examples (\mathbb{R}^n , \mathbb{C}^n , L_p , $C[a,b]$,...), some properties of normed space, semi normed space, product of normed space, Continuity of a Norm Function, Subspaces, Relation Between Metric Space and Normed Spaces , Completion of normed spaces.

3. Banach Spaces: ((Definition of Banach space, Examples of Banach space, the relation between Banach space and metric space, finite dimensional Banach space Sequences and Infinite series in normed spaces , Relation Between Absolutely Convergence and Banach Spaces, Relation Between Schauder Basis and Separable Space, Completion of Normed Space, Seminorms, Quotient Space, Product of Normed Space, Study Completeness

4. Inner product space: (pre- Hilbert space) : ((Definition, Examples (\mathbb{R}^n , \mathbb{C}^n , L_p , $C[a,b]$,...), some properties of inner product space, Cauchy- Schwarz inequality , parallelogram equality, polarization identity, orthogonality, the relation between inner product and other space, convergent in inner product space, ...)

5. Hilbert Spaces: ((definitions and some important examples of Hilbert space, Bessels inequality orthonormal sequence in Hilbert space separable Hilbert space , some important theorems in Hilbert space, Gram-Schmit process ...))

6. Linear Operators Functional: Definitions and Examples, Dim. of Range, Dim. of Null, Inverse Operator, Boundedness and Continuity of Operator, Study of Boundedness in Finite and Infinite Dim., Example of Unbounded Operator, Bounded Linear Extension Theorem, Isomorphism, Dual of normed Spaces and Its Dim., Completeness of the Dual, The Duality of some known spaces, Reflexivity of Normed Space, Spectral Theory of Linear Operations....