MATH 514

"Approximation Theory"

1. Polynomial Interpolation
    - Lagrange form
    - Divided Difference and Newton form
    - The k-th Divided Differences
    - Osculatory Interpolation
    - Evaluation of Newton form
2. Limitation of Polynomial Interpolation with Range example
    - Chebyshev Points
    - Interpolation at Chebyshev Points
3. Piecewise Linear Approximation
    - Broken Line Interpolation
    - Optimality of Broken Line Interpolation
    - Least-Square Approximation by Broken Lines
4. Best Approximation Properties of Complete Spline Interpolation and its error
    - Quadratic and Parabolic and Spline Interpolation
    - A representation for piecewise Polynomial Functions
    - Piecewise Polynomial Functions
    - Definition of Piecewise Polynomial Representation
5. Piecewise cubic Interpolation
    - Cubic Hermit Interpolation
    - Cubic Bessel Interpolation
    - Akima's Interpolation
    - Cubic Spline Interpolation

6. The Space $P_{k,\zeta,v}$ and the Truncated Power Basis
    - The Smoothing of a Histogram by Parabolic Splines
    - The Space $P_{k,\zeta,v}$
    - The Truncated Power Basis for $P_{k,\zeta}$ and $P_{k,\zeta,v}$
7. The Representation of Piecewise Polynomial Functions by B-Spline
    - The definition of B-Spline
    - A sequence of Parabolic B-Spline
    - Definition of Splines
    - Curry-Schoenberg Theorem
    - B-Representation
    - Conversion from One Representation to the other
    - The stable Evaluation of B-Splines and Splines
    - A Recurrence Relation for B-Splines
    - To plot B-Splines
    - Differentiation
    - Integration
8. Surface Approximation by Tensor Products
    - Tensor Product of two linear Spaces of Functions
    - The Calculation of Tensor Product Interpolant
    - Tensor Product Spline Interpolation
    - The Piecewise Polynomial-Representation of Tensor Product Spline Conversion from B-representation to Piecewise Polynomial-Representation

References:

1. A Practical Guide to Splines by **Carl de Boor**
2. Approximation Theory by **Powel**

3. Spline Analysis by **M. H. Schultz**
4. An Interpolation to Splines for use in Computer Graphics and Geometric modeling by **Barlles and Betlds Barsky**