➢ Calculus Catalog

Overview

This is the outline and guide for all notes of college calculus, including the catalog for the simplified version of review notes with corresponding *Notes Lite* and ➢*Simplified Content* and for the full version of first learning notes with corresponding *All Notes* and ➢*Full Content*.

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Quick Access

➢ ***Notes Lite***
➢ ***All Notes***

Simplified Content

➢ *Integral*

- ➢*Methods for Integration (Flux)*
  - Line Integral
    - To difinite integral
    - Curve in plane
      - Green Theorem
    - Curve in space
      - Stoke's Theorem
  - Surface Integral
    - To double integral
    - To triple integral
      - Divergence Theorem
- ➢*Integral Lite*

➢ *Differential*

- **Basic**
  - Total Differential
  - Chain rule
  - Unit tangent vector
  - Directional derivative
- **Tangent Plane**
- **Optimization**

    - Extrema
    - Customized optimization

➢ ***Vectors and Matrices***

- **Vectors**
    - Products
    - Unit vector
- **Matrix**
- **Equations of Planes**
- **Linear system**

➢ ***Sequences and Series***

- **Tests for Convergence**
- **Series**
    - Series for functions
    - Operation of series
- **Taylor Mean Value Theorem**
    - Remainder
    - Error bound

Full Content

➢ ***Sequences and Series***

- **Tests for Convergence**
    - Integral test
    - P-series
    - Upper bound practice
    - Comparison test
    - Limit comparison test
    - Ratio test(D'Alembert's Test)
    - Alternating Series Test(Leibniz's test)
    - Absolutely/Conditionally convergence
- **Error Bounds**
- **Series**
    - Power Series
        - Interval of convergence
        - Radius
    - Taylor Series for Function of one Variable
    - Binomial Series
    - Exponential and Logarithmic series for function
    - Trigonometric series for function
- **Operation of Series**
    - Differentiation
    - Integration

    - Substitution
    - Basic operation
- **Taylor Mean Value Theorem**
- **For Competition**

➢ *Vectors and Matrices*

- **Vectors**
    - Dot product
        - Projection
    - Cross product
        - Operational rule
    - Cosines
    - Vector function and Derivative
- **Matrix**
    - Linear equation
    - Transposition
    - Product
- **Equations of Planes**
    - Vectors in the plane and normal vector
- **Linear system**
    - Geometric meaning of the solution
    - Inverse and Adjoint matrix
    - Theorems of homogeneous and inhomogeneous

➢ *Differential*

- **Partial Derivative**
    - First-order and high-order expression
    - In graph
    - Linear to plane approximation
- **Total Differential**
    - Expression for multi-variables
    - Chain rule(parameterization and compound function)
    - Polar coordinates
    - Arc and tangent vector
- **Gradient and Directional Derivative**
    - Expression and Orthogonality of Gradient
    - Expression of directional derivative
    - Explain the gradient (change rate/direction)
    - Using the gradient to find the tangent plane
- **Optimization**
    - Critical point
    - Get Extreme by second partial derivative
    - Constrained optimization
    - Lagrange Function and Multipliers

    - Optimization with more than one constraints
    - Optimization with inequality constraints
- **Non-independent Variables**
    - Constrained differentials

➢ *Integral*

- **Double Integrals**
    - Average of function
- **Substitution in Double Integrals**
    - Double integrals in polar coordinates
    - Jocobian
- **Joint Density Function**
- **Line Integrals**
    - Line integrals with respect to arc length
        - With parametric functions
    - Line integrals with respect to coordinate axis
    - Vector fields
    - Line integrals in space
- **Flow line and flow**
- **Gradient Fields and potential function**
    - Definition and determination
    - Fundamental theorem for line integrals
        - Path independence
        - potentials function
    - Conservative field
- **Curl, Flux and Divergence**
- **Green Theorem**
    - In normal form
    - Connected region: single & multiple
- **Triple Integrals**
- **Flux Integration(Surface Integration)**
    - With respect to a surface
    - With respect to the coordinate
- **Divergence Theorem(Gauss Formula)**
    - The first Green formula with Laplace operator
- **Stoke's Theorem**