Calculus I & II

1. Review of Functions

1.1 Basic Notations
1.2 Function
1.3 Common Functions
1.4 Graph Shifting
1.5 Operations with Functions
1.6 Trigonometric Functions (A brief overview)

2. Limits and Continuity

2.1 Intuitive Approach
2.2 Limit (Numerical Approach)
2.3 Limit (Graphical Approach)
2.4 Limit (Algebraic Approach)
2.5 Limits as x approaches Infinity
2.6 Formal definition of Limit
2.7 Continuous Functions
2.8 Theorems on Continuous Functions

3. The Derivative

3.1 Introduction
3.2 Derivative of a Function by definition
3.3 Rules for Derivatives
3.4 Implicit Differentiation
3.5 Strategy for Differentiation
3.6 Linear Approximation and Differentials
3.7 Related Rates

4. Applications of the Derivatives

4.1 Introduction
4.2 Mean value and Theorem
4.3 Increasing and Decreasing Functions
4.4 Critical Points
4.5 Local and Absolute Extrema
4.6 Concavity
4.7 Curve Sketching
4.8 Optimization
4.9 Antiderivative

5. Integration

- 5.1 Approximating Area under a curve and above the x-axis
- 5.2 Definite Integral
- 5.3 Theorems of Definite Integral
- 5.4 Indefinite Integral (Antiderivatives)
- 5.5 More Rules for Indefinite Integrals
- 5.6 Strategy for Integration
- 5.7 The Fundamental Theorem of Calculus

6. Applications of the Definite Integral

- 6.1 Area
- 6.2 Moments and Center of Mass
- 6.3 Volume of a Solid of Revolution
- 6.4 Volume by Slicing
- 6.5 Arc Length
- 6.6 Area of a Surface of Revolution
- 6.7 Work
- 6.8 Hydrostatic Force

7. Calculus of Transcendental Functions

- 7.1 Basic Results
- 7.2 Derivatives of Logarithmic Function
- 7.3 Derivative and Antiderivative of Exponential Function
- 7.4 Re-visit the Power Rule and Trig. Rules
- 7.5 Derivative and Antiderivative of Inverse Trig. Functions
- 7.6 Derivative and Antiderivative of Hyperbolic Functions
- 7.7 Applications

8. Techniques of Integration

- 8.1 Integration by Parts
- 8.2 Integrals of sin^(m)x or cos^(n)x
- 8.3 Integrals of tan^(n)x or sec^(n)x
- 8.4 Integration by Trig. Substitution
- 8.5 Integrals of Rational Functions
- 8.6 More Substitutions
- 8.7 Strategy of Integration
- 8.8 Numerical Integration

9. Improper Integrals and Polar Coordinates

- 9.1 Indeterminate Forms
- 9.2 Improper Integrals
- 9.3 Graphs of Polar Equations
- 9.4 Area in Polar Coordinates
- 9.5 Parametric Equations

10. Infinite Series

10.1 Sequences
10.2 Infinite Series
10.3 Convergence Tests for Positive Term Series
10.4 Alternating Series and Absolute Convergence
10.5 Power Series
10.6 Taylor and Maclaurin Series
10.7 Calculus of Taylor Series

11. Vectors

11.1 Vectors in Two Dimensions
11.2 Vectors in Three Dimensions
11.3 The Dot Product
11.4 The Vector (Cross) Product
11.5 Planes in Space
11.6 Straight Lines in Space
11.7 Surfaces in Space