**Final Review**

**Unit 1: Limits and Their Properties**

1. **Finding Limits Graphically and Numerically** 
   1. Limits that fail to exist
   2. Limits using a table
   3. Limits using a graph
2. **Evaluating Limits Analytically** 
   1. Properties of Limits
   2. Simplifying with Algebra
   3. Rationalizing techniques
3. **Continuity and One-Sided Limits** 
   1. Intermediate Value Theorem
4. **Infinite Limits** 
   1. Vertical Asymptotes
5. **Limits at Infinity** 
   1. Horizontal Asymptotes
   2. Dividing every term by the greatest power of the denominator

**Unit 2: Differentiation**

1. **The Derivative and the Tangent Line Problem** 
   1. Limit definition for finding the derivative
   2. Alternate form of the derivative
   3. Slope of the tangent line
2. **Basic Differentiation Rules and Rates of Change** 
   1. Constant Rule
   2. Power Rule
   3. Constant multiple rule
   4. Sum and Difference rule
   5. Rate of change (Average Velocity =)
   6. s(t)

v(t)=s’(t)

a(t)=v’(t)=s’’(t)

1. **Product and Quotient Rules and Higher-Order Derivatives** 
   1. Product rule
   2. Quotient Rule
   3. Second and Nth Derivative
2. **The Chain Rule** 
   1. Chain rule
   2. Simplifying derivatives to use the rules
3. **Implicit Differentiation**
4. **Related Rates**

**Unit 3: Applications of Differentiation**

1. **Extrema on an Interval** 
   1. Maximum and Minimum
2. **Rolle's Theorem and the Mean Value Theorem** 
   1. Rolle’s theorem : if f(a)=f(b) , Then there is at least one point that also has a slope of 0.
   2. Mean Value Theorem: , there is a tangent line with the same slope of the secant line.
3. **Increasing and Decreasing Functions and the First Derivative Test** 
   1. First Derivative test: Max/Min : f’(x)=0
4. **Concavity and Second Derivative Test** 
   1. Second derivative test : Point of inflection : f’’(x)=0
5. **A Summary of Curve Sketching** 
   1. Concavity, Increasing/Decreasing, Intercepts, Max/Min, Points of inflection, & Asymptotes
6. **Differentials** 
   1. Maximum Volume /length/Area

**Unit 4: Integration**

1. **Antiderivatives and Indefinite Integration** 
   1. Basic integration rules: Power rule, Constant rule, Trig.
   2. General solutions: F(x) **+C**
   3. Particular solutions: (x,y) or when x=#
2. **Area** 
   1. Sigma Notation
   2. Left side /Right side Rectangle Sum
   3. Limit definition
3. **Riemann Sums and Definite Integrals** 
   1. Properties of definite integrals
4. **The Fundamental Theorem of Calculus** 
   1. Average Value Theorem for integrals ,
   2. Second fundamental theorem of Calculus,
   3. Net Change Theorem,
5. **Integration by Substitution** 
   1. U-Substitution

**Unit 5: Logarithmic, Exponential, and Other Transcendental Functions**

1. **The Natural Logarithmic Function: Differentiation and Integration**
2. **Inverse Trigonometric Functions: Differentiation  and Integration**
3. **Exponential Functions: Differentiation and Integration**
4. **Chain Rule with Natural Log and Exponential Functions**
5. **Bases Other than e and Applications Derivatives and Integrals**

**Unit 6: Differential Equations**

1. **Slope Fields**
2. **Differential Equations** 
   1. Differentials
   2. Growth and Decay
3. **Separation of Variables and Logistic Equations**

**Unit 7: Applications of Integration**

1. **Area of a Region Between Two Curves**
2. **Volume: The Disk and Washer Method**
3. **Arc Length**
4. **Surfaces of Revolution**

**Extra Topics**

**L’Hospitals Rule**