TN State Board

Topic Tree for "Application of Derivatives" (Chapter 7)

1. **Introduction to Differential Calculus**
    - Historical Background and Developments
    - Objectives and Applications in Various Fields

2. **Basic Concepts in Differentiation**
    - Definition of Derivative
    - Notations and Interpretations of Derivatives
    - Derivative as Slope and Rate of Change

3. **Applications of Derivatives**
    - Increasing and Decreasing Functions
    - Tangents and Normals to Curves
    - Optimization Problems
    - Related Rates of Change

4. **Mean Value Theorem (MVT)**
    - Statement of MVT
    - Geometric Interpretation
    - Applications of MVT in Real-life Scenarios

5. **Applications of the First Derivative**
    - Monotonicity and Critical Points
    - Finding Extrema (Maxima and Minima)
    - Use of First Derivative in Analyzing Functions

6. **Applications of the Second Derivative**
    - Concavity and Points of Inflection
    - Second Derivative Test for Local Extrema
    - Curve Sketching Using Derivatives

7. **L'Hôpital's Rule**
    - Indeterminate Forms (0/0 and ∞/∞)
    - Application of L'Hôpital's Rule to Solve Limits

8. **Optimization in Practical Problems**

- Optimization in Geometry (Shapes and Areas)
- Business and Economics Applications
- Optimization in Physics and Engineering

9. **Related Rates**
    - Problems Involving Two or More Variables Changing Over Time
    - Techniques for Solving Related Rates Problems
10. **Taylor and Maclaurin Series**
    - Introduction to Series Expansions
    - Applications of Taylor and Maclaurin Series in Approximations
11. **Summary and Exercises**
    - Chapter Summary and Key Formulas
    - Practice Exercises with Solutions for Reinforcement