AP Calculus (BC) Course Outline 2021.9.11. - 2022.3.19.

Instructor: Sam Wu

(10:30 am – 1:00 pm, on Saturday, totally 70 hours)

Chapter 1 Limits and Continuity **(Lesson 1 - 2)**

- 1.1 Definitions of Limits
- 1.2 Continuity
- 1.3 Limits Properties
- 1.4 Other Basic Limits
- 1.5 Asymptotes

Chapter 2 Differentiation **(Lesson 3 - 4)**

- 2.1 Definition of Derivative
- 2.2 Differentiation Rules
- 2.3 Implicit Differentiation
- 2.4 Estimating a Derivative
- 2.5 Derivative of the Inverse of a Function

Chapter 3 Applications of Differential Calculus **(Lesson 5 -7)**

- 3.1 Slope; Critical Points, Tangents and Normals
- 3.2 Increasing and Decreasing Functions
- 3.3 Maximum, Minimum, and Inflection Points
- 3.4 Curve Sketching
- 3.5 Optimization Problems
- 3.6 Local Linear Approximations
- 3.7 Motion along a Curve: Velocity and Acceleration
- 3.8 Related Rates
- 3.9 Slope of a Polar Curve

Chapter 4 Antiderivatives and the Definite Integral **(Lesson 8 - 10)**

- 4.1 Antiderivatives
- 4.2 Area
- 4.3 Definition of Definite Integral and Properties of Definite Integral
- 4.4 The Mean Value Theorem for Definite Integral
- 4.5 The Fundamental Theorem of Calculus

Chapter 5 Applications of the Definite Integral and Polar Coordinates (Lesson 11 - 14)

5.1 Area and Solids of Revolution

5.2 Volumes Using Cylindrical Shells and Volumes by Slicing

5.3 Arc Length and Work

5.4 Polar Coordinates

Chapter 6 Additional Techniques of Integration (Lesson 15 – 18)

6.1 Integration by Parts

6.2 Trigonometric Substitutions

6.3 Partial Fractions and Quadratic Expressions

6.4 Miscellaneous Substitutions

Test 1

Chapter 7 Differential Equations (Lesson 19 – 20)

7.1 Basic Definitions

7.2 Slope Fields

7.3 Derivatives of Implicitly Defined Functions

7.4 Euler's Method

7.5 Solving First-order Differential Equations

7.6 Exponential Growth and Decay

Chapter 8 Indeterminate Forms and Improper Integrals (Lesson 21 – 22)

8.1 The Indeterminate Form 0/0 and ∞/∞

8.2 Integral with Infinite Limits of Integration

8.3 Integrals with Discontinuous Integrands

8.4 Taylor's Formula

Chapter 9 Infinite Series (Lesson 23 - 25)

9.1 Infinite Sequences

9.2 Convergent or Divergent Infinite Series

9.3 Positive Term Series and Alternating Series

9.4 Absolute Convergence

9.5 Power Series and Power Series Representations of Functions

Review, Mock Test One or/and Mock Test Two (Lesson 26 – 28)