AP Calculus AB

Gyaanbhoomi Academic Curriculum

Course Description

AP Calculus AB is a college-level course in differential and integral calculus. The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The curriculum is structured according to the College Board's guidelines to prepare students for the AP Calculus AB examination.

Topics Covered

Unit 1: Limits and Continuity

- The Concept of a Limit: $\lim_{x \to c} f(x)$
- Evaluating Limits Algebraically (Factoring, Conjugates, L'Hôpital's Rule)
- Asymptotes and Limits at Infinity
- Continuity and the Intermediate Value Theorem (IVT)

Unit 2: Differentiation: Definition and Basic Rules

- Definition of the Derivative: $f'(x)$ and $\frac{dy}{dx}$
- Differentiability and Continuity
- Power, Product, and Quotient Rules
- Derivatives of Trigonometric, Exponential (e^x), and Logarithmic ($\ln x$) Functions

Unit 3: Advanced Differentiation Techniques

- The Chain Rule
- Implicit Differentiation
- Derivatives of Inverse Functions and Inverse Trigonometric Functions

Unit 4: Contextual Applications of Differentiation

- Interpreting the Derivative as a Rate of Change
- Straight-Line Motion: Position, Velocity, and Acceleration ($s(t), v(t), a(t)$)
- Related Rates
- Linear Approximation and Differentials

Unit 5: Analytical Applications of Differentiation

- Mean Value Theorem (MVT) and Extreme Value Theorem (EVT)
- Critical Points, Concavity, and Points of Inflection
- First and Second Derivative Tests for Extrema and Curve Sketching
- Optimization Problems

Unit 6: Integration and Accumulation of Change

- Antiderivatives and Indefinite Integrals: $\int f(x)\,dx$
- Riemann Sums and the Definite Integral: $\int_a^b f(x)\,dx$
- The Fundamental Theorem of Calculus (Parts 1 & 2)
- Integration by Substitution (u-Substitution)

Unit 7: Differential Equations

- Slope Fields
- Verifying Solutions to Differential Equations
- Solving Separable Differential Equations
- Modeling with Differential Equations (Exponential Growth and Decay)

Unit 8: Applications of Integration

- Finding the Average Value of a Function
- Finding the Area Between Two Curves
- Volume of Solids of Revolution (Disc and Washer Methods)
- Volume of Solids with Known Cross-Sections