AP Calculus BC

Gyaanbhoomi Academic Curriculum

Course Description

AP Calculus BC is a rigorous course equivalent to two semesters of college calculus. It includes all topics covered in AP Calculus AB, with additional in-depth exploration of advanced integration techniques, parametric equations, polar coordinates, vector-valued functions, and infinite sequences and series. The course is designed to prepare students for the AP Calculus BC examination.

Topics Covered

Unit 1: Limits, Differentiation, and Applications (Calculus AB Core)

- Comprehensive review and mastery of all AP Calculus AB topics including limits, continuity, differentiation rules, related rates, optimization, and curve sketching.

Unit 2: Integration and Applications (Calculus AB Core)

- Mastery of definite and indefinite integrals, the Fundamental Theorem of Calculus, area between curves, and volumes of solids (disk, washer, cross-section).

Unit 3: Advanced Integration Techniques

- Integration by Parts: $\int u\,dv = uv - \int v\,du$
- Integration using Partial Fraction Decomposition
- Improper Integrals (convergent vs. divergent)

Unit 4: Differential Equations

- All AB topics (slope fields, separable equations)
- Logistic Growth Model: $\frac{dy}{dt} = ky(L - y)$

Unit 5: Parametric, Polar, and Vector Functions

- Derivatives of Parametric and Vector-Valued Functions
- Arc Length for Parametric Curves: $L = \int_a^b \sqrt{(x'(t))^2 + (y'(t))^2}\,dt$
- Slope and Area in Polar Coordinates
- Motion along a curve (velocity and acceleration vectors)

Unit 6: Infinite Sequences and Series

- Convergence and Divergence of Sequences and Series
- Geometric Series, p-Series, Harmonic Series
- Tests for Convergence: Integral, Comparison, Limit Comparison, Alternating Series, and Ratio Tests

Unit 7: Taylor and Maclaurin Series

- Taylor Polynomial Approximations
- Maclaurin Series for common functions ($e^x, \sin x, \cos x, \frac{1}{1-x}$)
- Lagrange Error Bound for Taylor Polynomials
- Power Series: Radius and Interval of Convergence