Mathematics

AP Calculus BC 9/18/09

Functions, Graphs, and Limits	Derivatives	Integrals	Polynomial Approximations and Series
1. Parametric, polar and vector functions - The analysis of planar curves includes those given in parametric form, polar form and vector form.	2. Application of derivatives - Analysis of planar curves given in parametric form, polar form and vector form, including velocity and acceleration vectors. 3. Numerical solution of differential equations - using Euler's method. 4. L'Hôpital's Rule - Including its use in determining limits and convergence of improper integrals and series. 5. Computation of derivatives - Derivatives of parametric, polar and vector functions.	6. Applications of integrals - Appropriate integrals are used in a variety of applications to model physical, biological or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the integral of a rate of change to give accumulated change or using the method of setting up an approximating Riermann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a region (including a region bounded by polar curves), the volume of a solid with known cross sections, the average value of a function, the distance traveled by a particle along a line and the length of a curve (including a curve given in parametric form). 7. Techniques of antidifferentiation - Antiderivatives by substitution of variables (including change of limits for definite integrals), parts and simple partial fractions (non repeating linear factors only). - Improper integrals (as limits of definite integrals). 8. Applications of antidifferentiation - Solving logistic differential equations and using them in modeling.	9. Concept of series - A series is defined as a sequence of partial sums, and convergence is defined in terms of the limit of the sequence of partial sums. Technology can be used to explore convergence or divergence. 10. Series of constants - Motivating examples, including decimal expansion - Geometric series with applications - The harmonic series - Alternating series with error bound - Terms of series as areas of rectangles and their relationship to improper integrals, including the integral test and its use in testing the convergence of p-series - The ratio test for convergence and divergence - Comparing series to test for convergence or divergence. 11. Taylor series - Taylor polynomial approximation with graphical demonstration of convergence. (For example, viewing graphs of various Taylor polynomials of the sine function approximating the sine curve.) - Maclaurin series and the general Taylor series centered at x=a. - Maclaurin series for functions e^x , sin x, cos x and 1/(1-x) - Formal manipulation of Taylor series and shortcuts to computing Taylor series including substitution, differentiation, antidifferentiation and the formation of new series from known series. - Functions defined by power series - Radius and interval of convergence of power series - Lagrange error bound for Taylor polynomials