Murrieta Valley Unified School District
High School Course Outline
April 2013

Department: Mathematics

Course Title: Advanced Placement Calculus BC

Course Number: 2405

Grade Level: 12

Length of course: Year

Prerequisite: Successful completion of AP Calculus AB with a grade of C or better and teacher recommendation

UC/CSU (A-G) REQUIREMENT: C (Pending UC Approval)

I. Goals

The student will:

A. Demonstrate knowledge of parametric equations and polar coordinates *(Calculus Standards 6 & 9)*

B. Demonstrate the ability to apply the definite integral *(Calculus Standards 13, 14, 15, 16, 17, 18, 19, 20, & 21)*

C. Demonstrate knowledge of transformation methods of evaluating unfamiliar integrals *(Calculus Standard 22)*

D. Demonstrate the ability to solve differential equations *(Calculus Standards 11, 12, & 27)*

E. Demonstrate understanding of the concept of series as a sequence of partial sums *(Calculus Standards 23 & 24)*

F. Demonstrate knowledge of classifications of series (*Calculus Standards 23, 24, & 25)*

G. Demonstrate knowledge of Taylor and Maclaurin series *(Calculus Standard 26)*

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II. Outline of Content for Major Areas of Study

Semester I

A. Parametric equations and polar coordinates
   1. Conversion of polar coordinates to rectangular coordinates
   2. Conversion of rectangular coordinates to polar coordinates
   3. Writing rectangular equations in polar form
   4. Sketching curves given in polar form
   5. Graphs of parametric equations
   6. Elimination of the parameter
   7. Derivatives of parametric equations
   8. Derivatives of polar equations

B. Applications of the definite integral
   1. The length of a plane curve given in rectangular form
   2. The length of a curve given in parametric form
   3. The length of a plane curve in polar form
   4. The tangent line to polar and parametric curves
   5. The area of a region expressed in polar form
   6. The area of a surface of revolution
   7. Work performed by a variable force
   8. Fluid force on a submerged surface

C. Evaluation of unfamiliar integrals
   1. Integration by *u*-substitution
   2. Integration by parts
   3. Integration using trigonometric reduction formulas
   4. Integration by trigonometric substitution
   5. Integration by partial fractions
   6. Numerical integration
   7. Trapezoidal approximation
   8. Simpson's Rule
   9. Improper integrals
   10. L'Hopital's Rule

Semester II

A. Differential equations
   1. Separable differential equation
   2. Modeling growth and decay
   3. Logistics differential equations

B. Series and sequences
   1. Monotonicity of a sequence
   2. Convergence of a sequence
   3. Limits of sequences
   4. Partial sums of infinite series
   5. Convergence of infinite series

6. Sums of convergent infinite series
7. The closed form of convergent infinite series

C. Classifying series
1. Harmonic series
2. Convergence of a power series
3. Divergence test
4. Ratio test
5. Root test
6. Alternating series test
7. Absolute convergence
8. Conditional convergence

D. Taylor and Maclaurin series
1. The nth Taylor polynomial
2. The nth Maclaurin polynomial for e^x, $\sin x$, $\cos x$, and $\frac{1}{1-x}$
3. The radius and interval of convergence for a power series
4. Shortcuts for computing Taylor series
5. Forming new series from known series
6. Functions represented by power series
7. The Remainder Estimation Theorem

III. Accountability Determinants

A. Quizzes and tests

B. Advanced Placement Calculus practice assessments.

C. Projects and presentations

D. Homework assignments

IV. AP Exam Requirement

Students attempting to receive college credit for Advanced Placement and International Baccalaureate courses are required to pass a College Board exam which validates coursework. This exam **is not a requirement** for District High School credit, grade increases, or extra credit.

Student fees are allowable for Advanced Placement and International Baccalaureate Diploma examinations **for college credit**, so long as (1) taking the exam is not a course requirement; (2) the exam results have no impact on a pupil's grade or credit in a course; and (3) eligible economically disadvantaged high school pupils who receive school district funding towards the exam fee shall pay $5.00 of the fee. (EC sections 52240-52244; 52920-52922.)

V. Required Text

Finney, Ross L. *CALCULUS – Graphical, Numerical, Algebraic.* Needham, Massachusetts: Pearson/Prentice Hall, 2003.

VI. Supplementary Materials

Practice AP Calculus BC Examination