

## **Advanced Placement Calculus (BC)**

### **Course Syllabus – Spring 2010**

**Mr. Meyer**

**Prerequisites:** B/89 in Honors Calculus and/or approval of Department Chair

**Text:** Calculus, Early Transcendental Functions, Fourth Edition, Ron Larsen, Robert P. Hostetler, and Bruce H. Edwards, Boston: Houghton Mifflin Company, 2007.

### **Course Overview**

Students are taught with the primary goal of understanding calculus concepts. Visual representation of concepts, especially by extensive use of the graphing calculator is an integral part of the course. It is used in class daily, primarily to graph functions, find zeros and intercepts of functions, evaluate derivatives at a specific point, and evaluate definite integrals. Each student is required to have his own graphing calculator (TI-83 or TI-84). This calculator effort is used to help students develop an intuitive feel for concepts before they are approached analytically in the learning process.

It is expected that every student will be successful on the AP Calculus BC Exam in May. Throughout the year, homework problems, class activities, and tests include questions from old AP examinations. The mid-course examination is made up entirely of test items from old AP tests or items written in AP format. The last two weeks of the course is devoted to students working on old AP exams, and finally a practice exam.

### **Rule of Four**

From the beginning, students are taught using the “rule of four”, and are assigned problems presented graphically, numerically, analytically, and verbally. I frequently supplement the primary textbook, which emphasizes analytical methods, with problems requiring students to produce solutions using numerical methods and tabular data, graphical interpretations of various graphs, and well-written, verbal justification of solutions in complete sentences, to give them the opportunity to communicate their reasoning process in words, using proper math terminology and notation. Additionally, the connections between these representations is emphasized. The key objective is for students to be able to explain their answers by showing their work and justifying their responses in writing on selected homework, quizzes and tests. The written justification is expected to be a clear explanation of their solutions in well-written, complete sentences, being specific, avoiding the use of pronouns, and without any calculator notation. These practices are in consonance with articles published on AP Central that provide examples of acceptable wording.

### **Materials:**

Students are required to bring to each class the textbook, pencils, paper, a 3-ring loose-leaf binder notebook divided into four sections for notes, homework, handout problems from past A.P. exams, test corrections, and a graphing calculator. The TI-83/84 calculators are preferred. Students with other graphing calculators must become familiar with the instruction manual. Calculators may not contain games. Students who play games on their calculators during class time will have their calculators turned over to the Math Department Chair who will return the calculator after a conference with the student and/or his/her parent.

### **Assignments:**

Homework will be assigned daily, and most often collected the next day. Assignments submitted later than scheduled will not be accepted and a grade of zero

will result. Each problem should be completed with all steps clearly shown.

**Evaluation:**

Tests routinely will be given throughout each quarter. Homework and quizzes will account for 30% of the weekly grade. Tests will account for the remaining 70%. Weekly grades are cumulative and will account for 80% of each quarter grade with the cumulative mid-term/final exam accounting for the remaining 20%. The average of both quarters' grades will determine the final course grade.

**Make-up Work: For absences of fewer than three academic days** – All homework due during the period of absence will be submitted upon return to class. Missed tests and quizzes will generally be made up after school on the designated make-up day. **For longer, unplanned absences** – Students will submit a written timetable for the makeup of missed work. Failure to meet the timetable will result in a grade of zero being assigned for that particular piece of homework, quiz, or test. **For extended planned absences** – Students are responsible for determining, completing, and submitting all assignments due during the absence **prior to their departure unless other arrangements have been made with me.**

**PCHS Honor Code:**

Students will adhere to the Honor Code. Students may work cooperatively on homework problems. This includes giving and receiving explanations of problems and concepts, helping each other to spot mistakes, and comparing answers and methodologies. It does not include mindless copying or dictating solutions.

**Advice for Being Successful:**

1. Take notes; use them in doing homework;
2. Be prepared for class; do the homework assigned; identify difficulties.
3. Ask questions in class; expect to be questioned yourself.
4. Always use proper math symbols, vocabulary, and terminology.
5. Seek special help from me promptly if total dismay occurs.
6. Get notes from another student if an unforeseen absence occurs.
7. Notify me well ahead of time for planned absences.
8. Expect to be engaged in the learning process; a high level of intellectual curiosity is expected and encouraged.
9. Stay on schedule!

**Course Outline:**

**Unit 1 – Brief (2 day) Review of Limits and Their Properties, Differentiation, Applications of Differentiation, and Integration**

**Unit 2 - Differential Equations,**

- Use of slope fields to interpret a differential equation geometrically
- Drawing slope fields and solution curves for differential equations
- Euler's method as a numerical solution of a differential equation

**Unit 3 – Applications of Integration**

- Arc length

- Integration by parts
- Trigonometric integrals
- Trigonometric substitution
- Integration by partial fractions
- Solving logistic differential equations and using them in modeling
- Improper integrals and their convergence and divergence, including the use of L'Hopital's Rule

#### **Unit 4 – Infinite Series**

- Convergence and divergence of sequences
- Definition of a series as a sequence of partial sums
- Convergence of a series defined in terms of the limit of the sequence of partial sums of a series
- Introduction to convergence and divergence of a series by using technology on two examples to gain an intuitive understanding of the meaning of convergence
- Geometric series and applications
- The  $n$ th Term Test for divergence
- The Integral Test and its relationship to improper integrals and areas of rectangles
- Use of the Integral Test to introduce the test for  $p$ -series
- Comparisons of series, that must be communicated by students on assessments in complete well-written sentences
- Alternating series and the Alternating Series Remainder
- The Ratio and Root Tests
- Taylor polynomials and approximations: introduction using the graphing calculator
- Power Series and radius and interval of convergence
- Taylor and Maclaurin series for a given function
- Maclaurin series for  $\sin x$ ,  $\cos x$ ,  $e^x$ , and  $\frac{1}{1-x}$
- Manipulation of series, including substitution, addition of series, multiplication of series by a constant and/or a variable, differentiation of series, integration of series, and forming a new series from a known series
- Taylor's Theorem with the Lagrange Form of the Remainder (Lagrange Error Bound)

#### **Unit 5 – Plane Curves, Parametric Equations, and Polar Curves**

- Plane curves and parametric equations
- Parametric equations and calculus
- Parametric equations and vectors: motion along a curve, position, velocity, acceleration, speed, distance traveled
- Analysis of curves given in parametric and vector form, that must be communicated by students on assessments in complete well-written sentences
- Polar coordinates and polar graphs
- Analysis of curves given in polar form
- Area of a region bounded by polar curves

**After the AP Exam:**

## **Chapter 5: Hyperbolic Functions and applications**

### **Chapter 6: Differential Equations**

- Definitions and basic concepts of differential equations
- First order linear differential equations

#### **Classroom rules:**

1. **Come to class prepared.** Bring the textbook, notebook, paper, sharpened pencil, and graphing calculator every day. Limited bathroom breaks.
2. **Be in your seat with notebook open when the tardy bell rings.** Get out the homework for me to check it, and ask any questions by stating the page and problem number. Open the text.
3. **Show respect** to me and to your classmates by **not talking** when I am teaching or another student is responding. If you wish to speak, raise your hand (you will be recognized) before speaking.
4. Use **“Please”, “Thank You”, “Excuse Me”, “Pardon”, etc.**
5. **Have a Winning Attitude! Let’s have success!**