

**WESTERN KENTUCKY UNIVERSITY**  
**2016 ADVANCED PLACEMENT INSTITUTE**  
**JUNE 27 – July 1**  
**COURSE DESCRIPTION**  
**SUBJECT: Calculus AB**

**TARGET AUDIENCE:**

This course is designed to meet the needs of beginning teachers of Advanced Placement Calculus AB, and for teachers interested in reform calculus teaching strategies. An important feature of the week will be the integration of the graphing calculator in teaching topics.

- **Course Description:** The AP Calculus Summer Institute provides an exciting week of technology intensive calculus. AP Calculus courses have recently undergone a redesign with updated courses being defined in a new curriculum framework that ties course content and mathematical practices to clearly stated learning objectives. It will take effect in the 2016-17 school year. There will be an increased emphasis on conceptual understanding through the Mathematical Practices for AP Calculus (MPACs). During the week, participants will become familiar with the new framework and its implications for teaching the AP Calculus courses. They will receive a notebook containing AP exam resource questions, reform questions, concept worksheets, grading samples and scoring standards, as well as, reference materials. Highlights of the week include discussions of pedagogy, use of technology, consideration of topics from a reformed perspective, a review of multiple choice and free response questions, how to prepare students for the AP Calculus AB exam and the grading of the 2016 AP exam.
- **Included:**
  - College Board Workshop Handbook
  - Curriculum Materials and Activities
  - Sample Textbooks and/or E-books
  - TI-84 & TI-89 Activities
  - Flash drive

- Daily Agenda:
  - Monday
    - Beginning the Course
    - Advanced Placement Program and Resources (AP Central)
    - What's New in AP Calculus? (New Framework, MPAC's)
    - Multiple Representations and its implementation in Pre-AP, as well as, AP
    - Textbook Review/Notebook Tour
    - Pre-AP Curriculum
    - AP Audit Process and Samples/ Pacing
    - Reformed Questioning
    - Limits and Continuity
    - Issue: Technology
  - Tuesday
    - Average Rates of Change, Local Linearity and the Development of the Concept of the Derivative
    - The Derivative as a Function & What does it tell us?  $f$ ,  $f'$  and  $f''$ ?
    - Local and Global Extrema: The First and Second Derivative Tests
    - AP Problem Review
    - Derive Shortcut Rules for Differentiation
    - Graphical Analysis including Derivative Tests
    - Linearization and Estimation
    - Optimization
    - Implicit Differentiation
    - Issue: Resources (including websites)
  - Wednesday
    - Related Rates
    - Rectilinear Motion
    - Inverse Functions and Derivatives
    - Rolle's Theorem/Mean Value Theorem
    - Calculator Lab Experience
    - Beginning Integration/Anti-differentiation
    - Left, Right, Midpoint and Trapezoid Sums

- The Integral Function (ie. Definite Integral as an Accumulator)
- The Fundamental Theorem including Reformed Version (Net Change)
- Issue: Preparing for the AP Exam (Discuss Stand and Deliver/ AP Grading)
- Thursday
  - Techniques of Integration including Substitution of Variables
  - The Average Value of a Function
  - Area
  - Calculus in Motion Computer Software
  - Calculator Interface
  - Volumes of Solids of Revolution (Disks, Washers, Shells) including Models
  - Volumes of Known Cross Sections
  - Ways to Improve Your AP Score
- Friday
  - Slope Fields
  - Differential Equations and Initial Conditions
  - Issue: 2016 AP Exam Problems Review
  - Evaluations

**COURSE OBJECTIVES:**

1. To present the major topics of an AP Calculus course from a numerical, graphical, analytical and written point of view—the “reform” spirit.
2. To integrate graphing calculator technology in calculus instruction.
3. To review the 2016-2017 curriculum and exam revisions and cover new topical emphases implied by these changes, including the graphical interpretations of differential equations (slope fields), as well as, the Fundamental Theorem of Calculus.
4. To review the newly released 2016 exam, and to analyze topics which tested poorly.
5. To share and discuss the problems and promises of beginning an AP course.
6. To preview reference materials and texts appropriate for use in AP calculus.

7. To outline lesson plans, develop teaching strategies and formulate alternative forms of evaluation for use in the classroom.
8. To provide strategies for enhancing student question writing skills.

**FORMAT:**

Curriculum topics will be introduced via lecture and demonstration, problem solving activities, calculator lab activities and cooperative learning projects. Group discussions will focus on the issues of teaching an AP Calculus course--such issues to be determined from the needs and interests of the participants at the institute. Some issues identified for discussion in the past: student selection, prerequisite coursework, homework, grading, AP exam preparation, etc. The spirit of the "Calculus reform" will be emphasized.

**REQUIREMENTS, ASSIGNMENTS, ETC.:**

Participants are encouraged to bring their course textbook and any support materials they plan to use and/or have used and would like to share with the group. Each participant should bring the graphing calculator they will use in their classroom. The Texas Instruments TI-84 and TI-89 will be used by the instructor for demonstrations. TI-89s will be available for use during the week for anyone desiring to use same. Each participant will receive a notebook of curriculum topical developments cross referenced with technology support and AP examination questions. Sample questions which highlight daily topics will be given for overnight review. Teachers are encouraged to customize the materials for use in their own settings.