Math 520 *AP Calculus AB Certification for Teachers (3 graduate credit hours)*

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Course Goals: Goals for the course are for teachers to gain an appreciation and knowledge of the updated Curriculum Framework for AP Calculus AB by exploring the implications of calculus reform; understanding the current status of technology; modeling the teaching methods in the AP Calculus AB syllabus; reviewing exam questions, student performance data, and AP grading rubrics; discussing the problems and promises of conducting an AP course; developing teaching strategies and alternative forms of evaluation for use in the classroom, and providing examples for enhancing student writing skills in problem solutions.

The specific objectives for the institute are as follows:

1. To review the concepts and methods of calculus and analytic geometry.
2. To learn and demonstrate a mastery of the major topics of an AP Calculus AB course from a numerical, graphical, and analytical point of view.
3. To develop a syllabus for the AP Calculus AB course they will be teaching.
4. To integrate appropriate technology into their AP Calculus syllabus & instruction.

These objectives are measurable, specific, relevant, and time-specific by assessment of graded assignments, in-class group work and presentations, and a final exam.

Grading Procedure:

20% Graded assignments completed outside of class including a sample course syllabus

30% In-class group work and presentations

50% Cumulative final exam

Tentative Schedule:

Pre-institute Preparation. Review of pre-calculus topics that need to be mastered: Domain and range of polynomials, absolute value functions, trigonometric functions, exponential and logarithmic functions, and the inverse trigonometric functions, even and odd functions, reflections and translations, compositions of function, limits of functions (both definition and evaluation), definition of continuity, and problems involving continuity.

Day 1: Review of differentiation properties, definition of the derivative, differentiation rules, L'Hopital's rule, implicit differentiation, higher-order derivatives, tangent line and normal line problems, maximum and minimum values, points of inflection, increasing, decreasing, concavity, and graphing.

Day 2: Continued discussion of graphing, asymptotes, introduction to particle motion, extrema problems, and differentials.

Day 3: Related rates, introduction to antiderivatives and the definite integral, integration by inspection, Fundamental Theorem, and U-substitution.

Day 4: Continued discussion of integration techniques, integration by parts, average-values, area problems, and more particle motion - particularly acceleration, velocity, position, and total distance.

Day 5: Volumes of solids of revolution, elementary differential equations, practice tests on free-response questions, and integral derivation of logarithm function and exponential function.

Flip Teaching weekend: Participants will be assigned any remaining material to review before class resumes on Monday. This method will allow the remaining institute days to be devoted to individual and group study.

Day 6: Practice tests, more work on integration techniques, special integrals, numeric integration, and topics of interest or concern.

Day 7: General review day and put whole course in perspective and work on problem sets.

Day 8: Group work and study.

Day 9: Final exam and assessment form for institute.