

MATHEMATICAL INVESTIGATIONS IV

Course Description and Expectations

Mathematical Investigations is a four semester pre-calculus sequence of courses. MI-4 is the fourth course in this sequence. Prior to entry into MI-4, the student should demonstrate a strong background in Algebra and Geometry. This background includes a thorough understanding of the underlying concepts of both disciplines, a demonstrated ability with algebraic skills and geometric reasoning, and a schemata which encourages mathematical thinking. Upon successful completion of MI-4 or its equivalent, the student will enter a calculus sequence.

Course Outcomes for Mathematical Investigations:

All students will

- define and demonstrate techniques of problem solving in a variety of intra- and inter-disciplinary situations. These techniques should include the identification and development of strategies, the application of mathematical modeling, and the application of algorithmic and geometric processes.
- make conjectures and present logical, valid arguments for mathematical assertions, including direct proofs, indirect proofs, and proofs by mathematical induction.
- communicate in both written and oral form using the language of mathematics, including the correct use of proper mathematical symbols and terms.
- demonstrate mastery of sufficient mathematical knowledge and skills to engage in the study of calculus.
- demonstrate an understanding of functions and relations, both continuous and discrete, their geometric, algebraic, and numeric representations, and the algebra of functions.
- demonstrate an appreciation of the role and significance of mathematics in the development of our contemporary society.

Student Expectations:

All students are expected to

- be involved in class discussions and explorations.
- maintain a notebook containing class notes, homework assignments, Problem Sets, vocabulary list, formula lists, and other handouts.
- complete all assignments and problems sets in a timely manner.
- take responsibility for learning certain basic skills and relationships.
- take responsibility for seeking additional help as it is needed.
- have a graphing calculator and computer with them during each class.
- adhere to academic honesty guidelines as outlined in Student Handbook.
- any student who received lower than an 80% in MI-3 may be asked to complete additional WebWorks assignments throughout the term in order to review material from MI-3.

Teaching Philosophy:

Students need to be engaged in the exploration of mathematical concepts so that they can make those concepts their own. Often this takes more effort on the student's part than simply absorbing what the teacher is saying. Computer and calculator technology can provide tools for these investigations, but the student must provide the positive attitude and honest effort. In order to be successful in mathematics, students must eventually learn a basic set of skills and relationships and have them "at hand" to use when necessary. Students develop a basic set of understandings through conscientious attention to regular class assignments. If assignments are not completed, or are done at the last minute, such understandings are usually not learned as thoroughly as they need to be. Students are also encouraged to develop their abilities to express mathematical ideas orally and in writing, to explain what they are doing, what conjectures they are forming, and what conclusions they have reached. It is hoped that by expressing these experiences in words, the student will gain a deeper understanding of them.

Course Content:

This fourth course will concentrate on the study of advanced sequences and series, mathematical induction, two and three dimensional vector spaces, advanced trigonometry concepts, polar coordinates, and the pulling together of many previously presented concepts to enhance the later study of calculus. In addition to regular class work, the students will be given a set of problems to be completed each week. These sets are designed to (a) review, enhance and make connections with the student's past knowledge, (b) work with current concepts being discussed in class, and (c) preview ideas and techniques that will become important in the near future. Student work on these sets is evaluated on the basis of *complete* solutions (not just answers) which are to be written *neatly* and *legibly*. Occasionally students will find a concept on the set that is new or in need of review. Therefore, students are permitted and encouraged to obtain help with the concepts on these sets from books, teachers, other students, and the mathematics department instructional program aides; however, each student is responsible for turning in his or her own work. The use of calculators and computer software is encouraged.

Assessment/Evaluation:

Students have a variety of opportunities to demonstrate their abilities to fulfill the expectations of this course. Primarily, students will be evaluated on the quality and completeness of their notebooks, their involvement in class discussions and explorations, homework assignments, successful completion of the weekly problem sets, writing assignments, and their demonstration of knowledge and skills on exams.

Quarterly grades will be averaged using the following weighting:

- Individual Assessments 70%
- Weekly Problem Sets/Projects 20%
- Notebooks 10%

Semester grades will be averaged using the following weighting:

- Cumulative semester work 80%
- Semester Final Exam 20%

MI-4 Faculty Spring 2020

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