

Course Introduction

The purpose of the USMA Department of Mathematical Sciences core program is to provide each cadet a broad mathematical education emphasizing intellectual discipline, mastery of reasoning, practical applications, and the role of mathematics in society.

Our goal is a mathematics program that develops habits of mind for effective problem solving by applying mathematical knowledge to formulate and validate while leveraging the power of technology to calculate and investigate. The course you are enrolled in presents a variety of mathematical tools to help you critically evaluate a problem to come to a logical conclusion. Specifically, the goals of the course are focused in five areas; you will revisit each of these five areas in all four math course you take at USMA.

- **Base of knowledge.** You will learn several problem solving techniques in order to formulate and structure powerful mathematical models that can help you do many things. In particular, the experience gained in developing mathematical models in this course will help you answer many interesting questions like what savings plan do I need to begin in order to become a millionaire by a desired age, and how can I manipulate an image on my computer like those in many high tech movies.
- **Technology.** You will have numerous opportunities to use powerful software programs to enhance your capability to investigate possible solutions of the mathematical models that you develop in the course. Specifically, you will become competent in the basic commands of a computer algebra system (Mathematica) and of a computer spreadsheet (Excel) in order to make important predictions about things in every day life that you are concerned about.
- **Communication.** Being a good communicator is one of the most important characteristics of being a great leader. The fundamentals in successfully conveying how you want the troops under your command to perform an essential task and in describing your thought process in solving a mathematics problem are the same. All leaders must be able to clearly articulate their thoughts. You will have many opportunities to improve your communication skills both verbally and in writing. These opportunities include board presentations, various writing assignments, and the preparation of a technical report.
- **Confident and competent problems solvers.** You will develop modeling and problem solving abilities through in-class experiences, homework exercises, and a group project. These events will require you to analyze real world problems, make critical assumptions, model the problem, solve the model, and then interpret your results. Being able to do these things will help you in becoming more confident and competent solvers of all types of problems.
- **Develop habits of mind.** Some key components of habits of mind that you will become better at are: creativity, work ethic, thinking interdependently, critical thinking, lifelong learning, and curiosity. You can certainly reach a higher potential if all of the elements are incorporated and pursued simultaneously. Strategies will be implemented in this course that promote and develop each of these for you. Ultimately, you will be introduced to the importance of life long learning and will be encouraged to learn how you best learn and to develop good study habits.

You must take responsibility for your own learning and participate as an active learner. To realize the goals above, you must do several things:

- Success in this course depends heavily on your daily preparation. Dedicate the time required for success – we have designed this course so that the average student can succeed

with between 1-2 hours of daily preparation. If you habitually prepare less than this, your understanding and performance may measurably suffer.

- Come prepared for class with worked or attempted problems, understanding, and questions. Come to class knowing what you don't know so that you can ask questions. Unless otherwise directed by your instructor, you are responsible for the assigned readings and problems prior to coming to class.
- Participate in the instruction and discussion – this is *your* education; take charge!
- Seek assistance when needed – from the text, your classmates, or your instructor. We have some of the most professional and caring instructors teaching our course. Although they want you to succeed, they cannot learn for you.

Since the material covered in this course spans many topics from data fitting to the beginnings of Calculus, no single text is currently available to comprehensively cover the material. Professors in the USMA Department of Mathematical Sciences have written this reference designed specifically for this course. This text is also posted by lesson on the MA103 website at <http://www.dean.usma.edu/math/courses/MA103/index.htm>. You will want to use the online text frequently in order to access the many interactive websites we have developed for you. One of our goals in writing this text is to motivate you to read and understand the material in the textbook. With this in mind, this text is written in a very casual tone that we hope you will enjoy and appreciate.

The following professors have contributed to the development of this text:

Amanda Beecher	Peter Charbonneau
Amy H. Erickson	Andrew Glen
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Joseph Lindquist	Shawn McMurrin
Kerry Moores	Jack Picciuto
Jonathan Roginski	Don Small
Frank Wattenberg	

You have also received the text *Calculus Early Transcendentals* by James Stewart. You will use this text during the course both as a primary and secondary reference in order to make connections to Calculus throughout the course. This text will be the primary reference in MA104 Differential Calculus and MA205 Integral Calculus, your next two courses in the math sequence at USMA.