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Grade 12 Calculus
2010-11 School Year

Course Description

This course consists of between one and two semesters of college level calculus. We shall begin calculus by considering finite, and then infinite, progressions. This will introduce students to the idea of limit upon which calculus rests. Indeed, calculus may reasonably be considered the study of this idea and its implications. Other important basic ideas we will study include continuity and differentiability. We will use calculus to study algebraic, and selected non-algebraic functions such as trigonometric functions, the exponential function, and their inverse functions. We will consider what a function's derivatives tell us about the function's behavior. Students will practice the two general methods of integration which are substitution and integration by parts. Substitutions will include trigonometric substitutions. Applications will be chosen from the sciences and students will find the area of a plane region, volumes of solids and of solids of revolution, the length of a plane curve, moments, and center of mass. Throughout the course, coordinate geometry will be emphasized. A portion of the course shall be devoted to statistics and probability in order to prepare students for those topics on their IB exams.

Students will be given time to explore and understand the central ideas of calculus even if this results in covering fewer calculus topics, except that in no case will we cover less than a full college semester of calculus. Learning, and learning how to learn, some important mathematics well and with depth will prepare the students for their future mathematical and non-mathematical careers better than studying superficially a greater number of topics.

Core Goals

- Acquire a basic understanding of the idea of limit.
- Understand how calculus develops from the idea of limit.
- Acquire technical proficiency in using the basic operations of calculus.
- Apply calculus to a variety of problems chosen from the sciences.

Expectations

In mathematics class, every important point is made *both* audibly in spoken words *and* visually in words, symbols, and drawings that go on the board. When you take notes on a solution, derivation, or proof, you do the mathematics along with your teacher. It is like climbing a mountain step by step with an experienced guide, rather than merely hearing or seeing some directions. Taking notes raises your thinking to a higher level, because you interpret, judge, evaluate, and organize what you are seeing and hearing in class while it is happening.

Mathematics is *not* a grab bag of facts, procedures, techniques, and tricks. Knowing mathematics means using a few basic ideas with skill, insight, and understanding. It means you can often solve a problem seemingly *unlike* any you have already done or seen done.

You improve in mathematics through thoughtful and purposeful practice and discussion. Watching someone else do mathematics and feeling like you get it is no guarantee that *you* can do it on your own. Jump in! Question, discuss, argue, and practice!

In mathematics, your learning depends on your thoughtfully preparing assignments in time for the next class, in which we will discuss your comments and answer your questions about the assignment you completed. This is the best way to prepare for exams and to understand new material as it is presented in class. Expect to spend about 5 hours per week outside of class working on mathematics. If you slack off and fall behind, it will be extremely hard to catch up.

Textbook & Resources

Calculus, 8th edition, Varberg, Purcell, Rigdon
Student Solutions Manual for Calculus, 8th edition, Varberg, Purcell, Rigdon
Elementary Statistics, 7th ed., Robert Johnson
Statistical Tutor for Johnson's Elementary Statistics, 7th ed. Patricia Kuby & Robert Johnson
Mathematical Studies, Course Companion, Oxford Press
Exam Preparation & Practice Guide , Haese & Harris Publications

Web

I will maintain a simple web site at www.math.mnrt.net . I hope that parents and students will make use of this. If you are absent, you can get the day's assignment and any handouts from class at this site. I update the site every weekday almost always by 5:30 PM.

Here you will find

- the current assignment and all past assignments,
- copies of everything handed out in class including problem sets, and solutions to selected problems, but not including in-class exams and quizzes,
- my notes when the day's topic was especially complex,
- links to sites of mathematical interest.

This is not intended as a substitute for keeping an assignment notebook, which you are required to do. If you are absent from class, check here for the day's assignment and any handouts given during class. Parents will find the definitive answer to the question: "Do you have any mathematics homework?"

Required Materials

An organized three-ring binder with five divider tabs is required. An IB approved graphing calculator is required. Models recommended for the IB exams include among others the TI 84 Plus and Casio FX-9860G. My experience is Casio calculators are quicker and more intuitive to use than are TI calculators. If you have a graphing calculator that is neither of these, ask me, because I have access to the complete list of calculators allowed for use on the IB exam. The only makes IB permits are TI and Casio.

Course Outline

The first three weeks of the course will be devoted to the material that is specific to the IB exam. Thereafter, you will work a problem set each week of the school year on material that will appear on the IB exam. Throughout the school year, you will occasionally take exams closely based on the IB exam.

- Sets
- Logic
- Probability and statistics
- Functions and limits
- The derivative
- Applications of the derivative
- The integral
- Applications of the integral
- Transcendental functions
- Techniques of integration
- Indeterminate forms and improper integrals

Grading & Evaluation

Your trimester mastery grade is determined by full period exams, brief quizzes, and any graded assignments. Your scores on quizzes will make up 20% of your trimester grade. Exams and graded assignments will make up 80%. Exams and quizzes will have strict time limits, because they seek to assess your level of proficiency with the material that we recently covered. Proficiency often means that you can work a problem in a couple of minutes using the recent material we covered, rather than suffering 15 minutes of furious labor because you were unfamiliar with the recent material we covered.

> **Homework, although not graded, is the single most important factor in determining your grade on examinations and quizzes, and therefore your trimester grade.**

A quiz may be given at any time without prior announcement, although you can expect a short quiz about once per week. Your lowest quiz score will be dropped. Exams will be announced well in advance and will require a full class period to complete.

In sports, music, and theater you play or perform like you practice. Sloppy practice, sloppy performance. Just as you would insist on doing your personal best when practicing a sport at which you desire to excel, so too you should insist on your best when you practice mathematics.

Absence Policy

If you are absent for a quiz or an exam, *you* are expected to arrange to make it up. If you miss a class meeting, do borrow another student's notes to copy. Discussing those notes with the other student will further benefit both you and your kind classmate.

Late Work Policy

Homework is considered practice, so you will not be graded on it. There will be some graded assignments including take-home exams. The MCDS High School late work policy will apply to graded assignments. This policy states that for each day work is late, 10% will be deducted from the grade, up to 50%. If the work is never turned in, it will count as zero.

Getting Help

Please seek my help outside of class. I teach because I love to do mathematics with you. The student who makes the extra effort to get help when needed makes a very good impression on the teacher. Do not expect the impossible, though. If you have not kept up with assignments, meeting with me for an hour as the exam date approaches is not going to do you much good. If that was all it would take for you to do well, I would not be giving all these assignments in the first place. Remember that asking specific questions rather than saying, "I don't get it" will bring you the most useful help as well as evidence the effort you made in trying to master the material.

Students who wish to take the calculus AP exam should inform me of this by September 30, because the exam features several topics that are not treated in a college calculus course. I will then provide instruction on these topics.

Signature

I have read and discussed this syllabus with my child _____

Parent's Signature

I have read and discussed this syllabus with my parent(s) _____

Student's Signature