



## Grade 12 Mathematics, 2014-15 School Year

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### **Calculus I Syllabus 2014-15 School Year**

#### **Course Description**

Here is why this course is worth your effort: If you chose to go on in mathematics or in a mathematically intensive field, calculus is the prerequisite and this is your chance to learn it in the unique environment of MCDS. If you do not go on in mathematics, you will have had a solid and satisfying introduction to an accomplishment of your species that is second to no other human accomplishment.

This course consists of between one and two semesters of college level calculus. This course continues the calculus begun in *Advanced Algebra and Trigonometry*.

Calculus may reasonably be considered the study of this idea and its implications. Other important fundamental 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. Students will be given time to explore and understand the central ideas of calculus even if this results in covering fewer calculus topics.

Students who will take the IB Mathematical Studies Examination will, addition to the above, work a problem set each week on material that will appear on the IB exam. These students will also learn as much about sets, logic, probability, and statistics as is covered on the IB examination; they will write the required IB Internal Assessment paper.

## Core Goals

- Acquire 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

**Take notes.** 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 think through the mathematics along with your teacher. Taking notes raises your understanding to a higher level, because you interpret, judge, evaluate, and organize what you are seeing and hearing in class while it is happening.

**Do homework.** Your success in this course depends on your thoughtfully preparing assignments in time for the next class when we discuss your comments and answer your questions. Since each class builds upon the previous one, missing an assignment will leave you unable to follow and understand the material presented in the next class. This cascading effect once begun is hard to stop.

Your teacher respects your time. Homework will very rarely be given on weekends and never on vacations. With only one exception, there will be no projects to complete outside of class. The single exception to my “no projects policy” is the required IB IA. Expect to spend about 30 minutes per evening seriously working on mathematics without distractions.

**Participate in class.** You will understand the ideas of mathematics more quickly and more deeply by participating in class discussion. When your teacher or another student asks you to elaborate on an idea you have expressed, you have a wonderful opportunity to explore your own thoughts and practice articulating them clearly. Clarity of expression and clarity of thought develop together. The give and take of classroom discussion, though messy, is an essential and irreplaceable element in building your understanding of mathematics.

If as described above, you take notes, do homework, and participate, then you will find your understanding so solid and your skill so proficient that you will not need to study for exams.

## Textbook & Resources

**Textbooks.** *Calculus, 8th edition*, Varberg, Purcell, Rigdon. *Student Solutions Manual for Calculus, 8th edition*, Varberg, Purcell, Rigdon

**Web.** I maintain an easy to use web site at [www.math.mnrt.net](http://www.math.mnrt.net) . This is a valuable resource. If you are absent from class, check here for the day's assignment and any handouts or problem sets that were given out in class. If you lose a problem set or a handout, get another one here. Parents will find the definitive answer to the question: "Do you have any mathematics homework?" I update the site every weekday

almost always by 5:30 P.M.

At [www.math.mnrt.net](http://www.math.mnrt.net) you will find

- The current assignment and all past assignments.
- PDF copies of **every** item handed out in class.
- Copies of exams and quizzes are not included.
- Notes, if the day's topic was especially complex.
- An electronic copy of your textbook.
- Links to sites of mathematical interest.

## Required Materials

An organized three-ring binder with five divider tabs is required. For students taking the IB Mathematical Studies Exam, an IB approved graphing calculator is required. Students who are not taking this examination will find an inexpensive (\$12) scientific calculator entirely satisfactory.

## Course Outline

- Functions and limits
- Continuity and differentiability
- The derivative
- Applications of the derivative
- The indefinite integral
- The Riemann integral
- Applications of the integral
- Transcendental functions
- Techniques of integration
- Indeterminate forms and improper integral.
- Infinite Series
- For students taking the Mathematical Studies IB Examination: sets, logic, probability, and statistics.

## Grading & Evaluation

- Trimester grade determined by full period exams, brief quizzes, and any graded assignments.
- Quiz scores count no more than 20% of your trimester grade.
- Exams and graded assignments count no less than 80% of your trimester grade

Exams and quizzes will usually have strict time limits, because they seek to assess your level of proficiency. Proficiency often means that you can work a problem in a couple of minutes using the content we covered, rather than suffering 15 minutes of furious labor because you were unfamiliar with that content. Expect a short quiz about once per week, but a quiz may be given at any time without prior announcement. Your lowest quiz score will be dropped. Exams will be announced well in advance. Typically the exam will be given no sooner than two weeks after we have finished the material the exam covers.

## **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, borrow another student's notes to copy. Discussing those notes with the other student will further benefit both you and your kind classmate. If you want to do some homework, you might check [www.math.mnrt.net](http://www.math.mnrt.net) . I sometimes post assignments during the day, instead of at the end of the day, in case an absent student feels like doing homework. I definitely do not expect you do homework while you are ill.

## **Late Work Policy**

Homework is considered practice, so you typically will not be graded on it. There may be some graded assignments

## **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.