DIFFERENTIAL CALCULUS

MATHEMATICS 1600

Instructor:	Subhadip Chowdhury	**Email:**	schowdhu@bowdoin.edu
Class Sessions:	TR 10:05–11:30	**Classroom:**	Searles 215
Lab Sessions:	F 2:50–4:15	**Lab:**	Searles 117

Course Webpage

All regular announcements, instructor office hours, daily homework, handouts, lab assignments and individual grades will be posted on Blackboard

http://blackboard.bowdoin.edu

Check this site on a regular basis to track your progress. General course policies, syllabus, tentative schedule and outline of the course will be also available as pdf files on Blackboard.

Office Hours

- MR 2-3:30PM, T 1-2:30PM, F 1-2pm (by appointment only). These time slots are common for all the courses I am teaching this semester.
- There are also some course specific extra office hours/problem sessions in the lab time slots for some of the weeks in the semester. These are mentioned in the schedule.
- If you can't make it to any of the weekly office hours, you can email me to schedule appointments with me. These will depend on my availability.
- I am usually in the office every weekday about 10-4PM. *If my door is open*, you are welcome to knock on my door and come in with quick questions.

Prerequisites

In order to be considered for admission into Math 1600 you must have been given a mathematics placement of Math 1600 when you entered Bowdoin. If you do not have such a placement you will need the permission of the Chair of the Mathematics Department in order to register for Math 1600. No prior experience with mathematical computer software is required.

Textbooks and Supplies

- *Calculus: Single and Multivariable*, 7^{th} edition, by Hughes- Hallet, Gleason, McCallum et al.

  Alternately, just the single-variable version. A scan of chapter 1 is available on Blackboard until your personal copy arrives in mail.

- *Mathematica*, for your own computer.

  Bowdoin has a license allowing students to download the program onto their personal computers. To download Mathematica from the Bowdoin network go to

  https://www.bowdoin.edu/agreements/

- *A scientific calculator*

  Though Mathematica will be our most commonly used technology tool, students in Mathematics 1800-C should also have a scientific calculator.

Preparing before each class

To prepare for each class, you'll be assigned specific reading and practice exercises from the book in the class before.

The single most important thing you can do to succeed in this class is the assigned prep before class. I will assume you have done the reading and the practice exercises, so that we can spend class time on your questions, examples, and the applications. Specific assignments for each class are listed under **Prep Homework** in the blackboard menu. More details on these are below.

The Components of the Course

- There will be four types of homework assignments in this course.

  1. **Prep Homework.** You should work out the practice exercises as you read the corresponding section of book, before class meets. *Prep exercises are not to be turned in*.
  2. During class we will explore the ideas, work examples, address your questions, and study applications, so that you are prepared for the more challenging **Individual Homework** and **Team Homework**, designed to be worked after the associated class.

     (a) **Individual Homework** is typically due at the beginning of class on Tuesdays.

     (b) **Team Homework** is typically due at the beginning of class on Thursdays. More on these in next section.

     Please double-check the Homework section in the blackboard menu for the exact deadlines after every class.

3. **Lab Homework**. Depending on your familiarity with Mathematica, you may find that you complete labs during the lab period, or you may find that you need some more time to complete them as homework. Either way is fine. The labs are typically worked with a partner, and you can turn in one lab per team. Lab Homework is typically due on the Tuesday after the lab.

- Additionally, there will be weekly **Quizzes**, **two Midterms** given during the semester as well as a **Final Examination** at the end of the semester. The midterms will be during Friday Lab times. The final exam will be according to the Registrar's office schedule. All exams will emphasize the concepts of the course.

Team Homework and Collaborative Learning

The goal of **team homework** is to ensure that everyone learns with and from their peers. As a member of a group you are responsible not only for your own learning but also for the learning of the other members of your group. This means that when the work is completed and submitted, every member of the group should be able to explain how to solve all the problems. Here are some ideas that past students have come up with to help your group function at its full potential.

- **Schedule enough meetings**, well in advance, and make sure to attend every one of them.
- **Be prepared.** Prior to meeting do the readings and think about the problems.
- **Contribute** to the assignment solutions. Make sure that everyone is equally involved.
- **Listen carefully** and with respect to each other. Don't interrupt and don't tune out.
- **Ask for help** when you need it.
- **Give help** when it is requested.
- **Criticize ideas, not people.** Be tolerant, respectful, and caring.
- **Never agree to something you don't understand.** Don't rush to the finish before others.

Assignment Policies

- *Often there will be no example in class work or exam that exactly mirrors an assigned homework. This is by design.* To learn how to apply the principles discussed in the text and the class sessions, you cannot merely copy procedures you see laid out in examples.
- You should try to avoid working with others for the **Individual Homework**. Even if you do get help, you must write your final solution in your own words.
- The point of the homework is for you to work out what you do and don't understand. You should help each other to understand things if necessary, and come and ask me if all of you get stuck together. When your graded homework has been handed back to you, you should go through it and see if you understand what has been written on it by the grader. If you don't, you should come to office hours and ask.

- I will post the solutions to the assignments at the end of week every week. If you haven't got back your graded homework yet, please take a look at these to prepare for the quizzes next week.
- The groups for the team homeworks will be decided later on. But they might change over the semester.
- You must complete and attach an **Assignment Cover Sheet** with every submission. This sheet can be downloaded from Blackboard. Assignments are to be submitted via TBA.
- the Math 1600 homework box located at the South end of Searles' first floor hallway.
- As you are solving problems in this course, remember that getting the "answer" is only one of the steps. Don't think of what you write as just showing your instructor that you have done the homework. Write as if you were explaining what you are doing to one of your classmates who missed that day of class. Think of writing as part of the process of learning. The more carefully and clearly you write your mathematics, the more likely it is to be correct, and the more likely you will be to remember it. Correct answers without explanation will not reap full credit, but clear explanations with an incorrect answer can certainly earn partial credit.
- When appropriate you are encouraged to use Mathematica to help with problem solutions.

Low scores and late submission policies

- You can **replace up to three quiz grades** by going to a mathematics or related talk, and turning in a 1–2 page summary of the talk. Talks from other departments with a math flavor to them can also count. (eg: biology, chemistry, computer science, digital and computational studies, earth and oceanographic science, economics, education, environmental studies, neuroscience and physics are all good places to look) For talk announcements, check out the posters around Searles, Druckenmiller, Kanbar, Adams, VAC and elsewhere. Also check the Bowdoin events calendar, dept. websites, the digest, e-mail announcements, and the ES newsletter.
- In general, late submission (even 15 mins late) of homework assignments will **NOT** be accepted. In extenuating circumstances, with prior notice, I will try to provide extensions to individuals.
- I will drop two of your lowest *individual homework* scores, no-questions-asked.

Class Participation

Student participation is an integral part of this class and is highly valued. Everyone is expected to make thoughtful contributions in the form of questions, statements, and reasoned arguments. You will be also occasionally invited to present something on the board. We will regularly have group board work, where everyone will be expected to participate. Please express yourself within the bounds of courtesy and respect. Please share your thoughts and be willing to listen attentively to perspectives that may differ from your own.

Class Attendance

You cannot be an effective and involved member of the class unless you are present! Please try to be punctual as well.

Important Dates

Midterm # 1	Friday, September 28, 2:50–4:15PM
Midterm # 2	Friday, November 9, 2:50–4:15PM
Final Exam	Monday, December 17, 8:30-11:30AM

Please let me know immediately of any problems with these dates. Please note that the date of the final exam is set by the Registrar's office and cannot be altered. Individual changes in final exam dates are allowed only for particularly serious situations such as three exams in a two-day period.

Grading Policy

Grades will be given for each homework and lab. *Both your score and how it ranks relative to the other scores in the class will determine your final grade.*

The individual weights are as follows. I reserve the right to change these weights, with proper notice, later on in the course.

Individual Homework	10%
Team Homework	15%
Lab Homework	5%
Quizzes, class work and class participation	15%
Midterm 1	15%
Midterm 2	20%
Final exam	20%

Class Policies

- Be courteous when using mobile devices. Make sure your cell phone is turned fully off, or silent. If you must make or receive a call, please go outside the classroom.
- Use of computers or tablets is permitted for note-taking but only with prior permission. Please turn off your Wi-fi and sound.
- The final exam is based on all material covered in class. If you have to miss a lecture, then I strongly recommend you study the material you missed before you return to class. I recommend doing the following steps:
  - Look at the tentative course schedule from Blackboard.
  - Read the relevant sections from the textbooks, class note, internet etc.

  - Find someone who was in class and make a copy of their notes,

  Once you have done these steps, and you still need more clarification on lectures you missed, email me to schedule an appointment.

- In the spirit of Thanksgiving, there will be no homework assigned on Tuesday, November 20.
- *For any communication regarding this course, please email me from your bowdoin.edu email address. This is mainly for identity verification purposes.*

Miscellaneous Items of Interest

- Students seeking accommodations based on disabilities must provide documentation to Student Accessibility Office. Students are encouraged to discuss any special needs or accommodations with me at the beginning of the semester or as soon as you become aware of your needs. *In particular, I understand that the quizzes at the beginning of class can present a challenge, and I'm eager to discuss accommodation options with you.*

  Additional information regarding the accommodations process for students with disabilities can be found at:

  https://www.bowdoin.edu/accessibility/student-accessibility-office/request-accommodations.html

- As a faculty member I am considered a Responsible Employee, per the Student Sexual Misconduct and Gender Based Violence Policy. While my goal is for you to be able to share information related to your life experiences through discussion and written work, I want to be make sure you understand that as a Responsible Employee I am required to report disclosures of sexual misconduct, dating violence, stalking, and/or sexual and gender-based harassment to the University's Title IX Coordinator, Benje Douglas. My reporting to Benje does NOT mean that any actions will be taken beyond him reaching out to you and trying to schedule a time to talk to see what assistance you might need to be successful as a student here at Bowdoin. For more information please check out:

  www.bowdoin.edu/title-ix

The Honor Code

I support and adhere to the principles of The Bowdoin College Academic Honor Code. In particular, I will assume all members of the class are trustworthy in their dealings with me as well as their fellow classmates. However, should a violation of this trust be discovered, it will be reported to the Judiciary Board. The goal is not vengeance against those who violate the Code but fairness for those who adhere to it. If you have any questions about the appropriateness of a particular situation, please communicate with me.

Math 1600 (Differential Calculus)

Fall 2018 Schedule
Subhadip Chowdhury

Tuesday	Thursday	Friday (Lab)
	30-Aug	31-Aug
	Syllabus overview + Precalc diagnostic quiz	**Lab 0: Introduction to Mathematica**
4-Sep	6-Sep	7-Sep
1.1-1.3 (Idea of Functions, Exponential Functions)	1.4-1.5 (Logarithmic and Trigonometric Functions)	**Lab 1 (Plotting functions with Mathematica)**
11-Sep	13-Sep	14-Sep
New functions from old - Shifts and Stretches	1.6 (Powers, Polynomials, and Rational function)	**Handout 1 (Plotting Rational Functions) + Lab 2 (Interpolation)**
18-Sep	20-Sep	21-Sep
1.7-1.9 (Idea of Limit, One-sided Limit)	2.1-2.2 (Interpretation of Derivative as velocity - Average and Instantaneous)	**Handout 2 (Midterm 1 Practice Problems)**
25-Sep	27-Sep	28-Sep
2.3 (Derivative of a Function -Monotonic functions)	**Review**	**Midterm 1**
2-Oct	4-Oct	5-Oct
2.4 (Interpretation of the Deivative as rate of change)	2.5 (Second Derivative - Concavity)	**Fall Vacation**
9-Oct	11-Oct	12-Oct
Fall Vacation	**Handout 3 (Recap + Drawing graphs using derivative information)**	**Lab 3 (Limit definition of Derivatives)**
16-Oct	18-Oct	19-Oct
3.1-3.2 (Power Rule and Derivative of Exponential Functions)	3.3 (Product and Quotient Rule)	**Handout 4 (Practice Problems)**
23-Oct	25-Oct	26-Oct
3.4 (Chain Rule)	3.5 (Derivative of Trigonometric Functions)	**Handout 5 (Practice Problems)**
30-Oct	1-Nov	2-Nov
3.6 (Derivative of Inverse Functions - log, arcsin, arctan)	3.7 (Implicit Functions)	3.9 (Linear Approximation) **+ Lab 6 (Newton-Raphson method)**
6-Nov	8-Nov	9-Nov
Recap + Handout 6 (Practice Problems)	**Review**	**Midterm 2**
13-Nov	15-Nov	16-Nov
4.1 (Local Extrema, Second Derivative Test, Inflection Points)	4.2-4.3 (Global Optimization and Modeling)	**Lab 7 (4.4,4.8. Families of Functions, Idea of Parameters)**
20-Nov	22-Nov	23-Nov
4.6 (Rates and Related Rates)	**Thanksgiving**	**Thanksgiving**
27-Nov	29-Nov	30-Nov
Handout 7 + 5.1 (Measuring Distance - approximating area under a curve)	5.2 (The Definite Integral)	**Handout 8 (Practice Problems for Final)**
4-Dec	6-Dec	7-Dec
5.3 (The Fundamental Theorem of Calculus)	**Review**	Office hour until 4PM