Course Number and Section

MATH-SHU 009

Course Title Precalculus Fall 2020

Direct link to shared GDoc: (to be inserted)

Constant function Degree 0 · Linear function Degree 1 · Quadratic function Degree 2 · Cubic function Degree 3 · Quartic function Degree 4 · Quintic function Degree 5

Instructor Information

- Vlad Margarint
- **Office Address:** Academic Building (AB), Room 1133.
- **Email Address**: vdm2@nyu.edu
- Instructor website
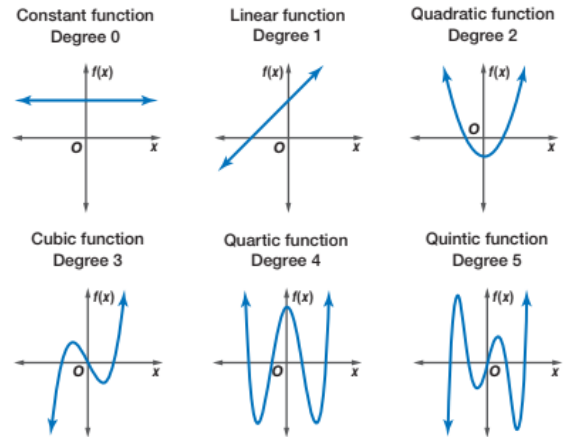
Welcome

Dear students, my name is Vlad Margarint and I will be the instructor for the PreCalculus class. Currently, I am a Postdoctoral Fellow at NYU Shanghai and I have research interested in Mathematical Physics: Stochastic and Complex Analysis; Schramm-Loewner evolutions and Rough Paths Theory, as well as Random Matrix Theory. I have completed my PhD in 2019 at the University of Oxford and previously I have been a MSc student at ETH Zurich and a Bachelor's student at the Faculty of Mathematics of the University of Bucharest.

Course Information

- Fall 2020 14 weeks 15-09-2020- 03-01-2021
- 4 credits
- Lectures: Twice weekly Monday 10:00-11:00, Wednesday 10:00-11:00 via Zoom at: (insert link).
- Recitations: Friday 10:00-11:30 via (to be established with the TA).
- Lab: Weekly Wednesday 19:00-20:00 via Zoom at (insert link)
- Office Hours: At 18:00 every Wednesday (via Zoom: insert link). In certain circumstances office hours may be scheduled at other times by appointment, feel free to reach out by email.
- Prerequisite: Placement examination via the NYU–SH mathematics placement exam.

Description:
This course is designed as a preparation for calculus and deals with the most commonly used functions in mathematics and mathematical modeling: polynomials, rational functions, exponential and logarithmic functions, and trigonometric functions. We will learn the basic properties of these functions, as well as how to manipulate them. This subject is very rich in both Mathematical content as well as applications! This semester we will put more emphasis on real-world applications of these concepts as well as a short introduction to Complex Numbers. The Complex Numbers are an extremely useful gadget and they have a wide range of applications to many disciplines including Physics and Engineering.

I designed the course in this manner to give everybody a variety of tools that will be useful in their future courses and professional life, independent of the major they decide to follow.
I hope you will enjoy the ride!

A thought about the future: Short history of Calculus: The theory was started by Newton and Leibniz, the first one trying to describe the Mathematics behind the laws of nature, while the second one was trying to understand in a more abstract manner the notion of tangent to a curve. From that moment until today there was a lot of progress in both the applied and the theoretical side of the theory. Now you get a sense why you will learn about this topic even if you do not plan to major in Mathematics. The field has an enormous range of applications and is the basic language for a lot of disciplines.

Course Learning Outcomes

Upon completion of this course, students will be able to:

- Manipulate and solve algebraic, exponential/logarithmic, and trigonometric expressions.
- Perform operations with complex numbers: addition, multiplication, useful identities involving the already introduced trigonometric functions.
- Identify and describe the properties of linear, quadratic, cubic, polynomial, rational, exponential, logarithmic and trigonometric functions (with brief applications to real life approximations such as cubic splines).
- Efficiently plot the graphs of linear, quadratic, polynomial, rational, exponential, logarithmic and trigonometric functions.
- Model real world problems by employing and manipulating simple equations and functions.
- Manipulate systems of equations and plot discontinuous functions.

Course Requirements

Learning Materials (including textbooks)

All students (both F2F and online) are required to bring to class the following items:

Textbook: James Stewartt, Lothar Redlin, Saleem Watson.

Precalculus: Mathematics for Calculus.

6th Edition. Cengage.

ISBN-13: 978-0-840-06807-1

Post-It: One 76x76 mm Post-It note pad, any color.

Notebook: An A4 or Folio size notebook.

Writing material: Pen, pencil and eraser.

Electronic device: Mobile phone, tablet or computer.

Grades (Assessment, Measurement and Evaluation)

When the solution to an exercise or problem is presented in the context of the quiz, homework, mini-project, midterm and final, the assessment will be done according to the categories given in the following rubric:

CATEGORY	4 Excellent work	3 Good work	2 Adequate work	1 Poor work
Result	The result is correct	The result is incorrect, but not contradictory with the formu- lation	The result is contradictory with the formu- lation	The result is not given at all.
Justification	The justification is complete and flawless	The steps of the justification are the correct ones, but there are minor mistakes	Some steps of the justification are either miss- ing or useless	No justification is given
Completion	All the neces- sary details for the understand- ing of the solu- tion are given	Many details for the understand- ing of the solu- tion are given	A few details for the under- standing of the solution are given	No details for the understand- ing of the solu- tion are given.
Neatness	The solution is neat and prop- erly organized	The steps of the justification as well as the an- swer are easily found	Some of the steps of the jus- tification OR the solution are hard to find	The solution is totally chaotic, looks like a scratch paper, or there is no solution
Timing	Solution is complete and submitted on time.	Solution is submitted on time but incomplete.	Solution is not submitted on time, is incomplete and the submitted exercises are poorly written.	Solution is not submitted at all.

The grade for this course will be determined according to the following formula:

| Assignments/Activities	% of Final Grade
Online quizzes every week-to be graded using Gradescope.	[20%]
Online homework every week- to be graded using Gradescope.	[20%]
Mini project that is done throughout the recitations with the help of the TA.	[10%]
Midterm Exam.	[25%]
Final Exam.	[25%]

Quizzes

The goal of the quizzes will be to address lower level Bloom's Knowledge and help the student to learn various nomenclature and background. It will consist of 4 problems with 25 points grade each.

Homework

Homework will contain more involved problems and exercises of the material discussed in class in the corresponding week.It will consist of 4 problems with 25 points grade each.

Mini-Projects

The topics of the mini-projects will be given in Week 8. The completion date is Week 13. They will cover various topics on Complex Numbers, graphing of functions and applications of this analysis in the real world. These topics contain beautiful mathematical results that can be applied in other branches
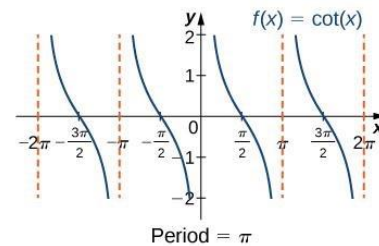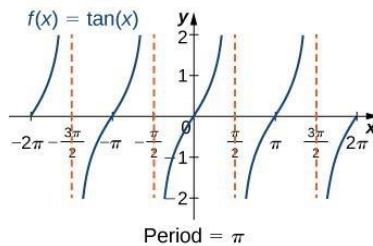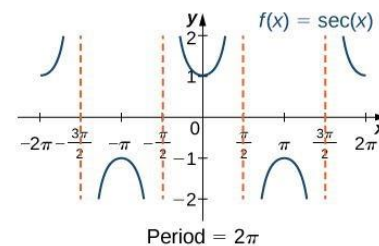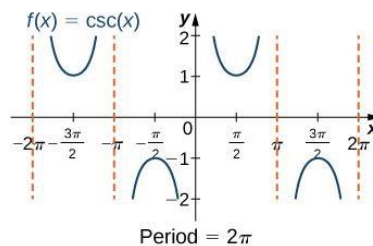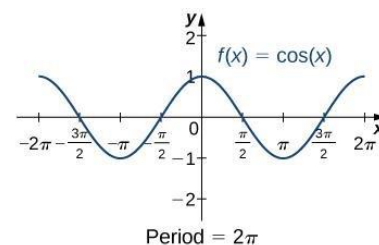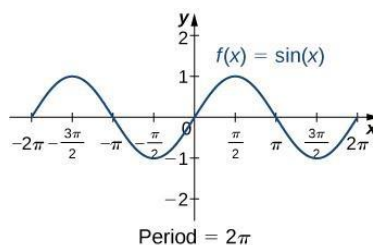
of Science, independently of what you will decide to do after the class. The mini-projects will consist of a short material studying beautiful mathematical results in the given direction (and if time permits, some simulations of these objects).

Please create and share (with editing privileges) with me (vdm2@nyu.edu) a Google Folder in your NYU Shanghai Google Drive, title it with your Last First Name. Place the mini project in this folder.

Grade Dissemination

Graded tests and materials in this course will be returned by the TA in NYU classes.

Grading Evaluation Scale

NYU Shanghai follows the same grading practices as NYU New York. The following grades may be awarded: A, A-, B+, B, B-, C+, C, C-, D+, D, F. In general, A indicates excellent work, B indicates good work, C indicates satisfactory work, and D indicates passable work and is the lowest passing grade. F indicates failure. There are some additional grades—P for pass, W for Withdrawal—which are awarded administratively.

Course Policies

Class Attendance and Participation

The course consists of two weekly lectures, a weekly recitation, and a weekly lab session. Attendance is mandatory to both lectures and recitations. The lab offers to student's additional time for supervised work in which to review the material and address particular difficulties with it. Also, during some lab sessions students will be able to catch up on some failed quizzes and to take practice exams. The lab is open to every precalculus student, and attendance becomes a requirement for students failing to get C or higher on a quiz or an exam. Performance in the Lab for these students will be a factor in deciding on borderline grades.

For students who will be able to attend F2F: Students are expected to attend all scheduled classes unless the instructor explicitly informs the class that other ways of doing the work are acceptable. The action to be taken regarding tardiness, absence from class or making up late work is the responsibility of the individual instructor.

For students who will be able to attend online: **For those in similar time zones**: Students are expected to attend all scheduled classes online via Zoom unless the instructor explicitly informs the class that other ways of doing the work are acceptable. The action to be taken regarding tardiness, absence from class or making up late work is the responsibility of the individual instructor.

For those in different time zones Students are expected to watch all scheduled classes online via Zoom recordings unless the instructor explicitly informs the class that other ways of doing the work are acceptable. The action to be taken regarding tardiness, absence from class or making up late work is the responsibility of the individual instructor.

Late Assignment

Assignments are due **at the date and time indicated in the syllabus**. Missed assignments will earn an F. Exceptions can be made only with the prior approval of the instructor. The late penalty for the final paper/project is one third of a letter grade per day. So, an 'A' project that is one day late will be graded an 'A⁻', two days late a 'B⁺', three days late a 'B', etc.

Rewrite Policy

No rewrites of quizzes, mini-projects midterm and finals are available.

Writing Policy

Commentary on written work will be delivered in written format, at the end of the assignment. However, upon request, an alternate delivery method can be used. All papers should demonstrate mastery of grammar, punctuation, spelling, and syntax expected of college level students. Use of APA/MLA is required for all papers. If you need writing assistance, please seek help from Student Support Services. All papers are to be word-processed, proofread, and solely the work of the author.

Group Work Policy

Everyone must take part in a mini-group project as detailed above. All members of a group will receive the same score; that is, the project is assessed and everyone receives this score. However, that number is only 90% of your grade for this project. The final 10% is individual and refers to your teamwork. Every person in the group will provide the instructor with a suggested grade for every other member of the group, and the instructor will assign a grade that is informed by those suggestions.

Instructional Technology

The students will be organized in groups and there will be a group leader who will be responsible with the communication for the group of people (The group leader can change every three weeks

on average). I expect to receive email from the group leaders, and I will reply usually as fast as I can (including weekends). The upper limit for email reply is 36 hours.

For everybody attending the class, both F2F and online I would like that the HW and Quizzes to be uploaded on Gradescope. The mini projects will be uploaded on a shared Google Document (GDoc) with me as mentioned in the sections above. The midterm and final exams will be as well added to the gradescope. The classes will be held on Zoom (or both F2F and Zoom) and will be recorded for those of you who will not be able to attend them real time. Various activities that will happen during classes will be uploaded to the shared GDoc. So, at a minimum requirement for the class is the use of a laptop/desktop with good internet connection and the familiarity with GDocs and use of Zoom.

Professionalism Policy

Please attend to all university policy and classroom etiquette procedures. Those not heeding the policies will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time, be attentive, and respectful for all class meetings. Students who habitually disturb the class by talking, arriving late or other unprofessional behavior may suffer a reduction in their final class grade.

Academic Honesty/Plagiarism

Violations of Academic Integrity include, but are not limited to:

- Cheating: Intentionally using or attempting to use unauthorized materials, information, notes, study aids, or other devices in any academic exercise.
- Fabrication and Falsification: Intentional and unauthorized alteration or invention of any information or citation in an academic exercise. Falsification is a matter of inventing or counterfeiting information for use in any academic exercise.
- Multiple Submissions: The submission of substantial portions of the same academic work for credit (including oral reports) more than once without authorization.
- Plagiarism: Intentionally or knowingly presenting the work of another as one's own (i.e., without proper acknowledgment of the source).
- Abuse of Academic Materials: Intentionally or knowingly destroying, stealing, or making inaccessible library or other academic resource materials.
- Complicity in Academic Dishonesty: Intentionally or knowingly helping or attempting to help another to commit an act of academic dishonesty.

Plagiarism includes, but is not limited to:
- Copying or borrowing liberally from someone else's work without his/her knowledge or permission; or with his/her knowledge or permission and turning it in as your own work.

- Copying of someone else's exam or paper.
- Allowing someone to turn in your work as his or her own.
- Not providing adequate references for cited work.
- Copying and pasting large quotes or passages without properly citing them.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the Students with Disabilities for further information. Students who are requesting academic accommodations are advised to reach out as early as possible in the semester for assistance.

Title IX Compliance

Title IX of the Education Amendments of 1972 (Title IX) prohibits discrimination on the basis of sex in educational programs. It protects victims of sexual or gender-based bullying and harassment and survivors of gender-based violence. Protection from the discrimination on the basis of sex includes protection from being retaliated against for filing a complaint of discrimination or harassment. University policies define prohibited conduct, provide informal and formal procedures for filing a complaint and a prompt and equitable resolution of complaints.

Religious Observances

New York University, as a nonsectarian institution, adheres to the general policy of including in its official calendar only certain legal holidays. However, it has also long been NYU policy that members of any religious group may, without penalty, excuse themselves from classes when compliance with their religious obligations requires it. In 1988, the University Senate affirmed this policy and passed the following resolution:
1. Students who anticipate being absent because of any religious observance should, whenever possible, notify faculty in advance of such anticipated absence.
2. Whenever feasible, examinations and assignment deadlines should not be scheduled on religious holidays. Any student absent from class because of religious beliefs shall not be penalized for any class, examination, or assignment deadline missed on that day or days.
3. If examinations or assignment deadlines are scheduled, any student who is unable to attend class because of religious beliefs shall be given the opportunity to make up that day or days.
4. No adverse or prejudicial effects shall result to any student who avails himself or her-self of the above provisions.

Tentative Course Schedule

Topics and Assignments

Week/Date	Topic/Concept	Reading: (Book section)	Tasks (F2F + online) All quizzes and Homework to be submitted to Gradescope
[Week 1, date]	Functions of real variable -examples and expressions L1 Overview & instructions on how to solve exercises. L2 Review. Recitation (to be inserted by TA)	1x 1x	Hwk 1 available Quiz 0
[Week 2, date]	Study of functions of real variables L1 Domain of a function. L2 Graphs of piecewise functions. Recitation (to be inserted by TA)	2.1 2.2	Hwk 2 available Hw1 hand in Quiz 1
[Week 3, date]	Rates of change in real variable functions L1 Increasing/decreasing intervals. L2 Average rate of change. Recitation (to be inserted by TA)	2.3 2.4	Hwk 3 available Hw 2 hand in Quiz 2

[Week 4, date]	Transformations of functions L1 Transformations of functions. L2 Algebra of functions. Recitation (to be inserted by TA)	2.5 2.6	Hwk 4 available Hw3 hand in Quiz 3
[Week 5, date]	Inverse functions L1 Inverse functions L2 Chapter 2 review Recitation (to be inserted by TA)	2.7 2.1-2.7	Hwk 5 available Hw 4 hand in Quiz 4
[Week 6, date]	Polynomial functions L1 Completing the square, parabolas L2 Graphing polynomials. Recitation (to be inserted by TA)	3.1 3.2	Hwk 6 available Hw 5 hand in Quiz 5
[Week 7, date]	Short diversion to complex numbers and operations with these numbers L1 Midterm. L2 Complex numbers. Recitation (to be inserted by TA)	3.5, 3.6	Hwk 7 available Hw 6 hand in Quiz 6

[Week 8, date]	Applications and analysis of graphs of functions L1 Rational functions. L2 Exponential function. Recitation (to be inserted by TA)	3.7 4.1	Hwk 8 available Hw 7 hand in Quiz 7
[Week 9, date]	Logarithms-Real life applications graphs of functions L1: The number e Continuously comp. Int. L2 Logarithms, Laws of logarithms. Recitation (to be inserted by TA)	4.2 4.3, 4.4	Hwk 9 available Hw 8 hand in Quiz 8
[Week 10, date]	Trigonometric functions-Real life applications graphs of functions L1 Trigonometric functions. L2 Graphs of sin and cos. Recitation (to be inserted by TA)	5.1, 5.2 5.3	Hwk 10 available Hw 9 hand in Quiz 9

[Week 11, date]	**Trigonometric functions extra+ Systems of equations** **L1** Other trigonometric graphs, **L2** System of equations. **Recitation** (to be inserted by TA)	5.3 5.4	Hwk 11 available Hw 10 hand in Quiz 10
[Week 12, date]	**Discontinuous functions - introduction** **L1** Systems of equations disc functions intro **L2** Discontinuous functions intro. **Recitation** (to be inserted by TA)	10.1 10.2	Hwk 12 available Hw 11 hand in Quiz 11
[Week 13, date]	**Recapitulation Part 1** **Recitation** (to be inserted by TA)		Hwk 13 available Hw 12 hand in Quiz 12
[Week 14, date]	**Recapitulation Part 2** **Recitation** (to be inserted by TA)		Hw 13 hand in Quiz 13
[Finals Week, date]	Final exam		Final exam