

Self-Paced First-Semester Calculus

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1 What does 'self-paced' mean?

It means that there are no lectures; you will teach yourself Calculus. The 'lectures' will be a time when most of us are in the same room, working on homework and explaining things to each other. Your attendance will benefit you and the others present, but it is not mandatory, *provided that you are making steady progress*.

You will take the exams when you are ready, and you will decide when that is. Specifically, you are required to complete a certain amount of homework before taking each exam. The exams do have generous deadlines; if you are not keeping pace your grade will be penalized. Even after the deadline, you cannot take an exam until you have completed the homework.

On the whole, this will take more of your time and energy than a traditional lecture course. On the upside, you get to decide when you spend this time and energy, and you will understand Calculus better than most traditional students. The dangers are procrastination and isolation. There are clues as to pacing below, and your instructor will warn you if you are falling behind. Isolation can be avoided by attending the lecture-time work sessions and office hours, and even better by finding a classmate to work with. If you find someone to work with, this course (any course) will go by faster and more successfully.

2 Where are you?

You have enrolled in a section of first-semester calculus. Your professor is Dr. O'Bryant. This course has 3 textbooks:

- Webwork (free and online),
- Calculus Demystified (about \$15 on amazon.com),
- Calculus (by Larson, Hostetler, and Edwards, about \$120).

This class replaces lectures with a plethora of office hours and homework. If you complete the homework, you will understand Calculus. The purpose of the office hours is to help you to not get stuck for too long on one problem, and of course you are welcome to show up and work, asking questions as they occur to you. The course has a website:

<http://wiener.math.csi.cuny.edu/~obryant/Professor/Classes.html>

This course divides Calculus into 27 "technologies"; each technology has a reading assignment, a few pencil-and-paper homework problems, and a few online homework problems. There are four midterm exams, each covering a separate collection of technologies, and a final exam which is cumulative. You can take the midterms whenever you are ready (there is a deadline!), and the final exam is scheduled for [???]. Each midterm will count toward 15% of your course grade, and the final constitutes the remaining portion.

The online homework is through Webwork, and *must be completed* before taking the relevant exam.

3 About Calculus

Calculus is the mathematics of change. [EXPAND DESCRIPTION, talk about Calculus solidifying the non-dark ages, and is a base for all science and engineering]

4 How to do Homework and Take Exams

4.1 Use a Pencil

I expect for every student to complete every homework problem correctly before taking an exam. You should solve the problems using pencil, not pen, and write on engineering paper whenever possible. On the first day of class, you will receive one sheet of engineering paper from the professor. You must keep your solutions organized and should bring your homework folder with you to office hours.

The best way to learn is to talk about what you are learning; you will learn more, better, and faster, if you find somebody to work with. You should understand each solution, even if somebody else showed it to you. When you put the solution into your homework folder, make sure you acknowledge with whom you discussed the problem. That means who helped you and whom you helped.

4.2 Webwork

Each technology has an associated Webwork assignment. You can access Webwork at

http://www.math.csi.cuny.edu/webwork2/Math231_ASYNC/

Your login ID is “firstname.lastname”, and your initial password is the last four digits of your student ID. You should change your password immediately; if you forget your password your professor can reset it for you. Also, you should add your email address to your Webwork profile immediately.

For each Webwork problem, you must supply a correct answer. In fact, if you try to input an incorrect answer, Webwork will tell you as much and ask you to try again. The system makes available to your professor the number of attempts you made for each problem, but this will not be incorporated into your grade. Even so, you shouldn't be guessing the answers! It's not time-effective.

Webwork does not require you to convert your answer to decimal form, or to simplify expressions. You can input `sqrt(ln(4))` for the square root of the natural logarithm of 4. Here are few more possible inputs:

`2^3` means “2 to the third power”, or 2^3 , or 8
`sin(3*pi/2)` means “the sine of $3\pi/2$ ”, or -1
`(2+tan(3))*(4-sin(5))^6-7/8` means “ $(2 + \tan(3))(4 - \sin(5))^6 - \frac{7}{8}$ ”, which is very close to 27620.3.

You can convert your answers to decimal form before inputting them. To be judged correct your answer should be within 0.01% of the correct answer. That means you should input at least 4 nonzero digits, and should carry 6 digits through your intermediate calculations.

4.3 Exams

The midterm exams are to be taken as soon as you master the relevant technologies, but you must schedule the exam with your professor. Everyone's midterm will be similar, and a sample is available. There are deadlines for taking each midterm: 'self-paced' means that you can go faster but not much slower than scheduled. If you are unable to take a midterm before the deadline (because you haven't completed the homework), then your grade will be penalized.

1. First midterm (limits and derivatives) (target: be ready on Feb 26)
 - (a) The Idea of Limit
 - (b) The Calculation of Limits
 - (c) The Idea of Continuity
 - (d) The Definition of the Derivative
 - (e) The Calculation of Derivatives
 - (f) The Derivative as a Rate of Change
 - (g) Implicit Differentiation
2. Second midterm (applications of differentiation) (target: be ready on Mar 22)
 - (a) The Graphing of Functions
 - (b) The Solution of Max/Min Problems
 - (c) The Calculation of Related Rates
 - (d) Falling Bodies
 - (e) The Line Tangent to a Function's Graph
 - (f) The Usage of Infinity
 - (g) More Optimization Problems
 - (h) Newton's Method
 - (i) Differentials
3. Third midterm (antiderivatives and integrals) (target: be ready on April 16)
 - (a) The Idea of Antiderivatives
 - (b) Riemann Sums and Area
 - (c) Signed Area
 - (d) The Area Between Curves
 - (e) The Linearity of Integration
4. Fourth midterm (miscellaneous topics) (target: be ready on May 14)
 - (a) Rates of Growth
 - (b) The Natural Logarithm as an Integral
 - (c) The Exponential Function
 - (d) Other Bases and Logarithmic Differentiation
 - (e) Differential Equations
 - (f) Inverse Functions
5. Final exam (comprehensive) (target: be ready on May 18)