

Math 132

Calculus II

Fall 2004

Overall Course Information.

Welcome to Calculus II! My name is Professor Spitznagel. It's worth getting to know your teacher, so please feel free to look at [A Little about Your Instructor](#) at your leisure.

This is a combined lecture/discussion section course in which I will be your coursemaster and instructor for three days per week, Monday, Wednesday, and Friday. On Tuesday or Thursday, depending on which [Recitation Section](#) you have signed up for, you will meet with a teaching assistant in a small group for discussion of homework problems.

The required textbook for the course is Schaum's College Outline of Calculus by Ayres and Mendelson. It is very similar to the older, slim calculus books of a half-century ago before the modern disease we know as "textbook bloat" set in. The advantage to using it is that you needn't worry about what to highlight and what to skip over. Virtually everything is important, and we will skip virtually nothing. Two side benefits are that the weight is about one half and the cost is about *one tenth* that of a regular textbook. When you buy your text at the bookstore, you will notice they were able to stock a substantial number of used copies, meaning that we are not the first to reject today's cumbersome textbooks in favor of Schaum's Outline.

If you would like to supplement the Schaum's Outline with a more chatty book, then Stewart's Calculus (stocked by the bookstore for Math 131) is a fine choice. Alternatively, if you have a friend who took calculus recently and still has the Stewart book, you may be able to borrow it for the semester. Note: The textbook used for the other calculus sequence, Math 127-128, does not have all the material we cover in Math 132 and so may not be a good choice as a supplement. However, the majority of you should be able to do just fine with Schaum's Outline only.

My official office hours are from 12 to 1, Monday and Wednesday. Except when I'm teaching, I am in my office most of every day, usually even into the early evening. I have a *whenever the light is on* policy, meaning that you are welcome to drop by whenever you find me in. In addition, you are welcome to call me at (314)935-6745 or email me:

ed_spitznagel@yahoo.com

We will be using Telesis in this course, so you are also welcome to enter the chat room (once it's working) and see if I'm signed on there. If I am not, you may still find a fellow student who can answer your question. Since answers you get from fellow students may not be fully accurate, I will check the chat room log every night and post any corrections as needed.

I will also use Telesis to post course announcements, rather than send them out by blanket email, so please check in the Telesis Announcements area on a regular basis. That eliminates the problem of students changing their email accounts but forgetting to update them on the Wash U records. For those students using non-university email addresses, it also solves the problem we encountered last winter when America OnLine "diagnosed" everything coming from Wash U as SPAM and refused to deliver it.

Grades will be determined from a weighted combination of your examination scores, your presentations in the discussion sections, and your laboratory report scores. The weights will

be 50% for your examination scores, 25% for your recitation section scores, and 25% for the laboratory scores. The laboratory requires a separate registration due to limitations of our WebSTAC system, so what we do is allot three credits to Math 132 and one credit to Math 132L. Whatever your overall grade is, you will receive that same letter grade for both 132 and 132L.

Lectures.

We will meet three days a week for lecture. Monday and Wednesday will be devoted to calculus theory and methods. On each of those days, I will introduce the topic of the day, comparing and contrasting it with what has been covered up to that point. I will also work several problems to illustrate the ideas being introduced.

Friday will be different, devoted to a real-life application of the topics covered on Monday and/or Wednesday, or in certain cases, topics from the previous week. No matter how thick a calculus book is, or how many applications it claims to cover, its “applications” are usually toy examples. On Fridays you will see detailed “case study” applications in science, engineering, social science, and humanities.

Even humanities? Yes. Ever hear of the Dutch painter Johannes (or Jan) Vermeer? He was the artist portrayed in the film “The Girl with the Pearl Earring.” Have you ever heard of Han van Meegeren? He was the greatest art *forger* of all time. He copied Vermeer’s style so well, used centuries-old canvasses, and artificially aged his paintings so cleverly that all the experts were fooled. The only way that they were finally convinced was by mathematical analysis of the lead-based white pigment that van Meegeren used. Here is one of his fakes, entitled *The Disciples in Emmaus*:



I hope that no matter what your field of study is, you will find all of these case studies of interest. As an example, a recent graduate of our school of engineering confessed to having paid no attention to anything except courses in his major of mechanical engineering. Lo and behold, he wound up working for a company rebuilding diesel locomotives, and wished he had paid much more attention in his classes that covered electricity. You see, diesel locomotives use diesel engines to run generators, which supply electricity to electric motors

that drive the axles. His job required expertise from both electrical and mechanical engineering. BTW, a similar principle is used in hybrid cars like the Toyota Prius and the 2005 Ford Hybrid Escape.

I hope that this course will convince you that mathematics in general, and calculus in particular, is not just some hurdle or intelligence test that you must pass to become a doctor, lawyer, or engineer.

In case you have to miss a class, you can find streaming video of the actual lectures at

<http://streaming.wustl.edu/courses/lectures/pages/math132.html>

The password is **ma4agE**. Note that the last letter of the password is upper case.

In addition, you will find my handwritten lecture notes and various spreadsheets I have used at

<http://artsci.wustl.edu/~ed/math132>

in the folders called notes and figures. The lecture notes will usually be posted the night before class, so if you like, you can bring a printed copy of them to class. Please note that I don't write down every word that I am going to say. I use my notes to guide what I will say and do, and there is always a degree of spontaneity in my classes. Perhaps an exceptionally good and altruistic note-taker would be willing to post a more complete set of lecture notes on his or her personal website. In any event, there will always be the streaming video.

Below is a link to an Excel spreadsheet containing the current schedule for the course. If any slippage occurs, or any corrections need to be made, I will let you know both in class and by Telesis Announcement, so you can print a revised copy.

<http://artsci.wustl.edu/~ed/math132/calendar.xls>

Recitation Sections.

Accompanying the three-days a week lectures, Math 132 also has once-a-week recitation sections. Traditionally, these consisted of teaching assistants spending most of the time answering questions, then giving a short quiz at the end of the hour. In the past, attendance has been poor, with many students just showing up for the quiz.

According to Confucius, "I hear and I forget. I see and I remember. I do and I understand." According to Sophocles, "One must learn by doing the thing; for though you think you know it, you have no certainty, until you try." Following both pieces of advice, I have converted these meetings into recitation sections so that you will see and participate in a lot of "doing."

Before coming to your assigned recitation section, you should do all problems that are assigned for it. You will be selected at random to present, on the blackboard, solutions to one or more of these problems. Scoring will be as follows: Three points for a correct solution, or one that has at most a trivial error such as $2+2=5$ or forgetting a minus sign. Two points if you have worked the problem to completion but have made a more substantial error or two trivial errors. One point if you have made a correct start on the problem but either cannot complete it, or have made more errors than justifies two points. No points if you cannot make a correct start to the problem. **Minus one point** if you are absent that day without an acceptable excuse.

The randomization is “with replacement,” meaning that you can be called upon more than once in a single hour. I will leave it to the gifted students to figure out how probable being called on twice or even three times in a single hour is. For any single student, it is quite likely to happen at least once during the semester. This means that after you have presented a problem, it will be a good idea to stick around until all problems have been presented, or you may wind up with a minus one for the second problem.

Absences are permitted only for medical, family, or religious reasons and require a note from a physician, an adult relative, or religious leader. Except for medical reasons, the excuse must be made ahead of time. All excuses must be cleared with Professor Jack Shapiro. The original note should be given to Professor Shapiro, and you should retain a copy for yourself.

To prevent the most obvious form of cheating, you are required to copy the solution onto the blackboard *from your own notebook*. Your name must be printed in one-inch or larger block letters on the notebook cover. To discourage a less obvious form of cheating, to earn the full three points you must be able to answer correctly any questions asked by your fellow students or by the teaching assistant. If not, you will receive two points rather than three. This also encourages you to show all your steps because if you do so, you are less likely to be asked questions.

The problems for which you are responsible depend on whether your recitation section is on Tuesday or Thursday. These are in a separate schedule at:

<http://artsci.wustl.edu/~ed/math132/homework.xls>

The pattern is simple: odd-numbered problems are to be done by students in Tuesday recitation sections, and even-numbered problems are to be done by students in Thursday recitation sections. I have assigned all problems pertaining to the Monday and Wednesday from-the-book lectures. I will make up case-study problems pertaining to the Friday lectures as we progress through the course.

Exceptions: The lecture on Friday September 3rd is a from-the-book lecture, not a case-study lecture. The first recitation sections begin the week of September 6th, after Labor Day for *both* the Tuesday and Thursday sections. There is no recitation section on September 2nd.

Note that the examinations will consist of randomly selected problems from the full Tuesday-Thursday list, so in the long run, you will need to master all of the problems in the schedule. If your recitation section is on Tuesday, you might consider teaming up with a student whose recitation section is on Thursday, or vice-versa. Another option is simply to come to one of the recitation sections on the other day and be a “fly on the wall.”

Laboratories.

With the financial support of the Howard Hughes Medical Institute, we have added an actual physical sciences laboratory to our course. Just as with the Chemistry Department laboratories, this laboratory has a separate course ID, 132L, and separate credit from Math 132. Our experiments are not so painstaking as Chemistry’s, so Math 132L is worth one unit of credit, whereas Chem 151 is worth two units.

These laboratories will begin the week of September 13th. Prior to that time, the bookstore will stock a copy of the laboratory manual for you to buy. The weeks you will be in laboratory are determined by the lab section number, as described in the Course Listings book and WebSTAC. Basically, it's alternate weeks, depending on whether your section number is even or odd.

Although our scheduling constraints may prevent perfect meshing, what you do in lab will be related to what we do in lecture, and I plan to do some additional data acquisition and analysis in class.

Examinations.

If you wander around the chemistry buildings, you are likely to see almost perfect bell-shaped ("Normal") distributions of chemistry examination scores, typically centered at about 50%. Since these examinations are graded with partial credit, it is quite possible for a student to have done not even one problem correctly and still receive a median grade, likely a B, in the course.

Furthermore, when students get their graded examinations back, they often don't even look at them to see where their mistakes are. In the mathematics department, the majority of the returned examinations are never picked up.

Years ago I developed a solution to this pair of problems, *the computer-generated second chance examination*. Each of the three exam nights, you will be given two copies of the exam. During the two-hour period, you will work the first copy and transfer your numeric answers to an answer sheet. On that copy of the exam, your answer is judged simply right or wrong. By the next morning, a report will be posted showing which problems you got right. (Being within one percent of the true value is considered to be a correct answer.) If you miss one or more problems, you will have until the following morning to redo those problems, and you will receive 2/3 credit for each one done correctly the second time. In the rare event that you miss the second time around, your written work is then partial-credit graded for an appropriate amount of credit less than the 2/3.

Notice that a student typically can get all or most problems right at least by the second try, and the student definitely is forced to learn from his or her mistakes.

If you would like to see how the system works, go to

<http://www.math.wustl.edu>

then select "Old Exams on line," roll down to the bottom and look at Math 320 for Fall 2002.

Those are statistics exams, so they may not give you the full flavor of what our exams will be. Therefore, for anyone who wants to give it a try, I will provide a dry-run of the exam system (first pass only) on Friday, September 24th at 8-9am, in our regular classroom.

The final exam will be the same format as the three in-semester exams, except unfortunately there can be no second chance feature. University regulations require that final exams be limited to the two-hour slots reserved for them. Instead, the final exams will be partial-credit graded on the first pass.

The key to this exam system is being able to randomize the numbers in the problems, so that no two instances of the same problem have exactly the same answer. Since most problems will involve differentiation and integration, and graphing calculators like the popular TI-83 can do these operations numerically (functions nDeriv and fnInt under MATH on the TI-83), I have to prohibit their use during the exams. That's why you'll need to resurrect or invest in a cheap scientific calculator, to the tune of \$10 to \$15. Any of the TI-30 calculators will be fine. Outside of the exams, you're certainly welcome to use graphing calculators. They can be powerful study aids for calculus.

Now, if for any reason you are unhappy with this style of partial credit exam, please let me know. I'm perfectly ok with changing to multiple-choice format if the majority would prefer that.

The in-semester examinations are given **Tuesday** evenings, 6:30-8:30 pm on September 28th, October 19th, and November 16th. They are given in large lecture rooms based on your last name, with randomized assigned seating within the rooms. The rooms and row assignments will be posted on

<http://www.math.wustl.edu>

twenty-four hours before the exam times. It's a good idea to check each time you have an exam, because the rooms will not necessarily remain the same for each exam.

The final examination will be 10:30am-12:30pm on **Thursday**, December 16th. Be sure to tell your parents that you have to be here as late as the 16th, so they don't make too early a plane reservation for you.

The final exam counts twice as much as any one of the in-semester exams. That is, each in-semester exam counts for 10% of your course grade, and the final exam counts for 20% of your course grade.

As with the recitation sections, exam absences are permitted only for medical, family, or religious reasons and require a note from a physician, an adult relative, or religious leader. Except for medical reasons, the excuse must be made ahead of time. All excuses must be cleared with Professor Jack Shapiro. The original note should be given to Professor Shapiro, and you should retain a copy for yourself.

In the case of non-medical reasons for missing an exam, it is often possible to arrange for a student to take the exam at a slightly different time. For example, for traveling athletes, we will usually entrust a copy of the exam to a coach, to administer it while the student is away on a trip. For this reason, please let us know as far ahead of time as possible, so the time and proctor can be arranged.

Grades.

Course grades are determined by combining the exam grades (50%), the recitation grades (25%), and the laboratory grades (25%). Ideally, some form of an A (\pm) will be in the 90-100% range, a B (\pm) in the 80-90% range, a C (\pm) in the 70-80% range, a D (\pm) in the 60-70% range, and an F in the 0-60% range. If this rule produces a distribution lower than last fall's, I will slide the cutpoints downward to match last fall's distribution. Last fall there were 19% A's, 44% B's, 32% C's, and 5% D's and F's, about the same distribution that Chem 111A had. That is, you can't do worse than students last year, but potentially you can do better.

A Little about Your Instructor.

I received my bachelor's degree at Xavier University in Cincinnati, and my master's and doctor's degrees at University of Chicago. I then taught at Northwestern University before coming to Washington University. I have always been interested in quality teaching. In fact, when I interviewed here, I told my future chair that I took teaching very seriously. He responded that the department felt the same way, and indeed that has always been true. I can tell you, by contrast, at Northwestern University, the president was quoted *in their alumni magazine* as saying that when a faculty member's research career wasn't going well, s/he would compensate by throwing her/himself into teaching. In other words, high quality teaching was viewed as a sign of bad research and a reason to get rid of the faculty member.

Let me say that I aim to give you the best possible course, both in terms of material and an enjoyable experience learning it. Over the years I have received eleven awards for teaching from:

Council of Students of Arts and Sciences Award	1979
Council of Students of Arts and Sciences Award	1982
Homecoming Award	1986
Burlington Northern Achievement in Teaching Award	1989
St. Louis Education Day Award	1989
Founders Day Award	1989
St. Louis Education Day Award	1990
Council of Students of Arts and Sciences Award	1997
Missouri Section, Mathematical Association of America	2000
National Award, Mathematical Association of America	2002
Council of Students of Arts and Sciences Award	2004

All of these ultimately derive from student nominations, and I have to tell you about one more that I cherish just as much as the official ones. In 1974 I had two students, Rick Gershberg and Hilde Wette, who took my undergraduate statistics course and then volunteered to serve as graders and help session consultants the following semester. They presented me with a little trophy cup, engraved with, "Ed Spitznagel, World's Most Innovative Math Professor, 1975, Hilde and Rick." It was, in fact, my very first teaching award.

Will every student in Math 132 think I'm the cat's meow? No, I would like that to be true and will work very hard so that you enjoy the course and learn a lot, but there are bound to be a few negative students. Below in clickable files are comments I received last year in the statistics course I taught, Math 320. You may get the most accurate feeling for what's ahead by reading all of them:

<http://artsci.wustl.edu/~ed/math132/tellothers.pdf>

<http://artsci.wustl.edu/~ed/math132/tellprof.pdf>