# University of Minnesota, Morris
# Syllabus for Math 1102, Calculus II, Fall 2019

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## 1 Introduction

Welcome to Calculus II. The primary goal of the course is

**1.** to help you learn single-variable calculus past what you learned in Calculus I.

The secondary goal is

**2.** to help you learn *Mathematica* past what you learned in Calculus I.

And, of course, we'll try to have some fun in the process!

We will be following Chapters 6-11 of

Single Variable Calculus, early transcendentals, sixth edition,
by James Stewart.

As you can see from the day-to-day schedule, we will be omitting a few sections from these chapters.

This course aligns with several components of the UMM Student Learning Outcomes (`http://https://www4.morris.umn.edu/student-learning-outcomes`), including problem-solving, quantitative literacy, and technology literacy.

To find out more about me, you should visit `http://davidproberts.net`. For relatively brief questions, a good time to talk to me is right before or after class. For longer questions, I am looking forward to seeing you in my office hours. You can find me in the Science Building, room 2360. You can also reach me at `roberts@morris.umn.edu` or my office phone number 589-6348.

University policy says "one credit is defined as equivalent to an average of three hours of learning effort per week..." Our course is a five-credit course, meeting approximately five hours per week. Thus, *you are expected to spend 10 hours per week working outside of class.* My job is to make your learning effort as efficient and pleasant as possible, but it is your job to put in the quality time!

## 2 Course components

**Book.** The book presents the material we will be learning in an organized and comprehensive way. A good idea would be to try to understand the main point of a given section *before* coming to the corresponding class.

**Class periods.** We meet four times a week in Science 3510.

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|---|---|
| Mondays | 3:30-4:35, |
| Tuesdays | 2:40-4:20, (longer class period starting earlier!) |
| Wednesdays | 3:30-4:35, |
| Fridays | 3:30-4:35. |

Class periods will be a mixture of activities. I will lecture on some of the high points of the section. I will work out solutions to problems like your homework problems. Generally we will do a fair amount of work using *Mathematica*. I will be asking the class questions and you should always feel free to ask questions throughout the class period. The aim is to have you feel that each class period is well spent.

**Homework.** Homework is a crucial component of our course. For almost all the daily homework, we will be using the program *WeBWorK.* You can log in from any computer with an internet connection. The problems I have chosen range from straightforward to challenging. For straightforward problems you may be able to simply type in the right answer. For the more challenging ones, you can expect to do a lot of paper and pencil and/or *Mathematica* work before obtaining the right answer.

You log into *WeBWorK* at

`http://webwork.morris.umn.edu/webwork2/F19Calc2_Roberts/`

(save this address!). Your username is a your UMM username, as in `chang437`. Your initial password is your student number, as in `5341318`. You should change your password to keep your webwork scores private.

All students are assigned very similar problem sets. However numbers and other aspects of the problems vary slightly from student to student. *You are highly encouraged to help each other out on the problem sets.* Because of the randomization feature of *WeBWorK*, it's possible to have lots of communication between students, and still have each student go through the details himself or herself. It would be a good idea for you to print out your individualized homework set, especially so you can study from it later.

*WeBWorK* also grades your work, and in total homework counts for 25% of your grade, as will be explained at the end of this syllabus. The whole point of *WeBWorK* is to help you learn the material *efficiently* and *without stress.* If you give the wrong answer to a problem, you may get no credit or partial credit, depending on the problem. You should then try to figure out what you did wrong, and do the problem again. You're given an unlimited number of tries to get full credit on each problem. Your credit level on a problem can never go down. The one thing to be concerned about is the due time, which is 2pm on the day of class. After the due time, you can't get more credit on a problem set (although you can still practice with it). I would recommend doing the problem sets well before before they are due.

*WeBWorK* is simply a tool to help you learn calculus. Like all tools, it has to be used properly to work. You need to be *thinking* and *actively trying to learn* all the time as you're doing the problem set (certainly not just "doing the minimum to get the credit"). If something's confusing to you, that's a perfect question for the next day's class. If you can only do the problems with lots of assistance from your classmates, that should be an immediate red flag that something's wrong. You should then see me to talk about the situation.

I estimate that working through and reflecting on the homework assignments should take about five hours a week. So this should be roughly half of your out-of-class work.

**Mathematica.** The catalog says that in Calculus I, "Students learn the basics of a computer algebra system." In Calculus II, "Students use a computer algebra system." Accordingly, I am starting the course assuming that you know the basics of *Mathematica*, the system we use here. We will be learning more *Mathematica* as we go through the course. If you feel you're not comfortable with the basics, I have two handouts to help you. Also I will go over some of the basics for interested students on Wednesday night of the first week.

**The first test.** The first test in this course will be *very early* in the semester, in fact on Tuesday, September 10, which is just our seventh class meeting. There are two purposes to having a test so early. One purpose is to help you take the course seriously from the very beginning, including the *Mathematica* component. The other purpose is relevant for just the few of you who may not be sure this is the right

course for you. The next day, Wednesday, September 11, is the last day to drop this (or any) course without a W appearing on your transcript. If you do drop a course, you want to do it by this Wednesday.

**Review for tests.** There will be a review before some of the tests. These review periods will be driven by your questions, so make sure you bring questions helpful to you to the review classes. I'd recommend spending at least three hours reviewing for each test. You can redo *WebWorK* problems, do other *WeBWorK* problems, do other problems from the text, practice *Mathematica*, internalize your lecture notes, etc.

**Tests.** There will be six in-class tests and then a final. Tests 1, 3, and 5 will be on Tuesdays, with some students taking the test in the first 50 minutes and some students taking the test in last 50 minutes. On these tests you will be allowed to use *Mathematica*, but not calculators. In fact, to do well on these three tests you will have to use *Mathematica*. Tests 2, 4, and 6 will fill an entire 65-minute class period. On these tests you will work without *Mathematica* or even calculators.The final exam will cover all the material in the course. It will be two hours in length and will be a no-aids-allowed test, like Tests 2, 4, and 6. However on these no-aids-allowed tests, you will be also be required to produce exact *Mathematica* code.

For full credit on tests, it is essential that solutions be written well. What is a well-written solution? *It is not just scratchwork with a numeric solution boxed.* Rather a good solution is a *neat organized document* which *explains* the solution. With its worked-out examples, the book provides many examples of a good solution. Typically, complete English sentences are interspersed with displayed equations; often, a graph or a table is part of the explanation too. The lectures will also provide many examples of well-written solutions. To repeat the point, *solutions with totally correct computations lacking in necessary good explanations will tend to receive 80%, not 100%.*

Note that your work on *WeBWorK* does not give you practice with writing solutions well. So as you study for tests, keep in mind that the lectures and reading are essential components too, not just the homework.

**Out of class resources.** Once again, I highly recommend that you work with your classmates outside of class. Students who work together are generally more successful and find the whole experience more enjoyable.

You are always welcome in my office hours. They are

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|---|---|
| Mondays, | 10:00-11:00, |
| Wednesdays, | 11:00-12:00, |
| Fridays, | 1:00-2:00. |

Since my office hour varies with the day, there should be at least one day per week that you can attend. Also we can meet by appointment. *I would like each of you to drop by at least once in the first two weeks, if only so we can get to know each other better.*

In Briggs library you can tutored by more advanced students for free. Hours are not finalized, but will be something like Monday to Thursday, 7pm to 10pm. This math room is not at all reserved for students who are struggling. All students are welcome and encouraged to make use of it.

It is university policy to provide reasonable accommodations to students with disabilities. Please contact me or the Office of Academic Success, 589-6178, Room 240 Briggs Library to discuss accommodations needs.

**Assessment.** Student work from this class may be anonymously shared by this program or UMM to assess achievement of student learning outcomes. If you do not wish your work to contribute to learning assessment, please inform me.

## 3 Grading policy

Grades will be determined as follows.

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|---|---|
| Homework (almost all *WeBWorK*) | 250 points |
| Six 100-point tests, lowest dropped | 500 points |
| Class Citizenship | 50 points |
| One final exam | 200 points |
| | 1000 points |

Class citizenship includes coming to class on time, staying on task, asking good questions, answering questions that I ask, helping other students, not using cellphones, not using computers inappropriately, not wearing headphones, and so on. You are allowed to take tests at a different date only with an excuse I consider valid.

Numerical grades will be converted to letter grades using the follow cutoffs.

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|---|---|---|---|---|---|---|---|---|---|
| 93% | 90% | 87% | 73% | 80% | 77% | 73% | 70% | 65% | 60% |
| A | A- | B+ | B | B- | C+ | C | C- | D+ | D |

A numerical score less than 60% corresponds to an F. *Please note that you are not competing against your fellow students.* I will adjust the difficulty of the questions and the scale of the grading so that say a B- score corresponds to what I consider B- achievement. Please note that your performance will likely fluctuate substantially. However my experience says that with so many components to your final grade, the final grade always adequately reflects your achievement.

University regulations require that I print the University-wide uniform grading policy. Here it is.

**A** Represents achievement that is outstanding relative to the level necessary to meet course requirements.

**B** Represents achievement that is significantly above the level necessary to meet course requirements.

**C** Represents achievement that meets the course requirements in every respect.

**D** Represents achievement that is worthy of credit even though it fails to fully meet the course requirements.

**F** Represents failure and indicates that the coursework was completed but at a level unworthy of credit, or was not completed and there was no agreement between the instructor and student that the student would be temporarily given an incomplete.

A few of you may be taking the course S-N. In this case, you need to earn a C- to receive an S.

There is no extra credit for this course. Standard university policies apply to this course and are at `www.policy.umn.edu/Policies/Education/Education/SYLLABUSREQUIREMENTS.html`

## 4 Daily schedule

On the next two pages you'll see a day-by-day schedule for the course. We will adhere closely to this schedule, but there are likely to be slight deviations.

| Date | Topic |
|---|---|
| Wed, Aug 28 | Review of integration via Chpt 5 review |
| Wed, Aug 28 | *Optional evening review of Mathematica basics. 8:15pm* |
| Fri, Aug 30 | 6.1 Area between curves |
| | |
| Mon, Sept 2 | *No class: Labor Day* |
| Tues, Sept 3 | 6.2 Volumes by Slices |
| Wed, Sept 4 | 6.3 Volumes by Shells and *Mathematica* practice |
| Fri, Sept 6 | 6.5 Average Values |
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| Mon, Sept 9 | Review via your questions |
| Tue, Sept 10 | **Test 1: 6.1-6.3,6.5** (*Mathematica*) |
| Wed, Sept 11 | 7.1 Integration by Parts |
| Fri, Sept 13 | 7.2 Trigonometric Integrals |
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| Mon, Sept 16 | 7.3 Trigonometric Substitution |
| Tue, Sept 17 | 7.4 Partial Fractions |
| Wed, Sept 18 | 7.5 Strategies for Integration |
| Fri, Sept 20 | 7.6 Hand vs. table vs. CAS integration |
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| Mon, Sept 23 | 7.7 Approximate Integration |
| Tues, Sept 24 | 7.8 Improper Integrals |
| Wed, Sept 25 | Review via your questions |
| Fri, Sept 27 | **Test 2: 7.1–7.8** (hand) |
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| Mon, Sept 30 | 8.1 Arc Length |
| Tue, Oct 1 | 8.2 Area of a Surface of Revolution |
| Wed, Oct 2 | 8.3 Applications to Physics and Engineering |
| Fri, Oct 4 | 8.3 Applications to Physics and Engineering |
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| Mon, Oct 7 | 8.4 Applications to Economics and Biology |
| Tue, Oct 8 | 8.4 Applications to Economics and Biology |
| Wed, Oct 9 | 8.5 Probability |
| Fri, Oct 11 | 8.5 Probability |
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| Mon Oct 14 | Review via your questions |
| Tue, Oct 15 | **Test 3: 8.1–8.5** (*Mathematica*) |
| Wed, Oct 16 | 9.1 Modeling with Differential Equations |
| Fri, Oct 18 | 9.2 Direction Fields and Euler's Method |

| Date | Topic |
|---|---|
| Mon, Oct 21 | *No Class: Fall Break* |
| Tue, Oct 22 | *No Class: Fall Break* |
| Wed, Oct 23 | 9.2 Direction Fields and Euler's Method |
| Fri, Oct 25 | 9.3 Separable Equations |
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| Mon, Oct 28 | 9.3 Separable Equations |
| Tue, Oct 29 | 9.4 Models of Population Growth |
| Wed, Oct 30 | 9.4 Models of Population Growth |
| Fri, Nov 1 | Review via your questions |
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| Mon, Nov 4 | **Test 4: 9.1–9.4** (hand) |
| Tue, Nov 5 | 10.1 Curves defined by parametric equations |
| Wed, Nov 6 | 10.2 Calculus with parametric curves |
| Fri, Nov 8 | 10.3 Polar coordinates |
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| Mon, Nov 11 | 10.4 Areas and Lengths in Polar Coordinates |
| Tue, Nov 12 | 10.4 Areas and Lengths in Polar Coordinates |
| Wed, Nov 13 | 10.5 Conic Sections |
| Fri, Nov 15 | 10.6 Conic Sections in Polar Coordinates |
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| Mon, Nov 18 | Review via your questions |
| Tue, Nov 19 | **Test 5: 10.1-10.6** (*Mathematica)* |
| Wed, Nov 20 | 11.1 Sequences |
| Fri, Nov 22 | 11.2 Series |
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| Mon, Nov 25 | 11.3 The Integral Test and Estimates of Sums |
| Tue, Nov 26 | 11.4 The Comparison Tests |
| Wed, Nov 27 | 11.5 Alternating Series |
| Fri, Nov 29 | *No class: Thanksgiving* |
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| Mon, Dec 2 | 11.6 Absolute Convergence: the Ratio and Root Tests |
| Tue, Dec 3 | 11.7 Strategy for testing series |
| Tue, Dec 3 | *Optional evening review* |
| Wed, Dec 4 | **Test 6: 11.1–11.7** (hand) |
| Fri, Dec 6 | 11.8 Power series |
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| Mon, Dec 9 | 11.9 Representations of Functions as Power Series |
| Tue, Dec 10 | 11.10 Taylor and Maclaurin Series |
| Wed, Dec 11 | 11.10 Taylor and Maclaurin Series |
| Fri, Dec 13 | Review of course |
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| Tues, Dec 17 | **Final Exam** (hand) 1:30-3:30pm |