

MATH 118xg: Fundamental Principles of Calculus

University of Southern California, Spring 2023

Table of contents

[Course and instructor information](#)
[Course materials and resources](#)
[Course snapshot](#)
[Learning outcomes](#)
[Grading system](#)
[Practice problems, prelims, and credits](#)
[Tips for success](#)
[Schedule of lectures](#)
[Policies and statements](#)
[Support resources](#)

Course and instructor information

Instructor: Jared Warner
Office: KAP 256 and [Zoom room](#)
Office hours: MWF 11-11:50am
TTh 8:30-9:30pm (virtual only)
E-mail: hjwarner@usc.edu

Lectures:

39430 - MWF, 2-2:50pm, SGM 601

Discussions:

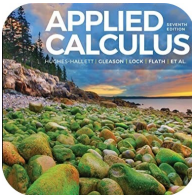



39431 - TTh, 12-12:50pm, KAP 137

39432 - TTh, 1-1:50pm, KAP 134

Teaching Assistant: Yuxiang Zhan
Office: USC Math Center, KAP 263
Office hours: See the schedule [here](#)
E-mail: zhanyuxi@usc.edu

Course Description: Derivatives and extrema, with emphasis on exponential and logarithmic growth. The definite integral and the Fundamental Theorem of Calculus. Functions of several variables and their extrema; constrained optimization. Applications to business and economics.

Course materials and resources

| | |
|--|--|
| <p>Textbook (recommended)</p>  <p>Hughes-Hallett. <i>Applied Calculus</i>, Seventh Edition. You should purchase the book by accessing the WileyPLUS online practice problem platform linked on our course Blackboard.</p> | <p>Gradescope (required)</p>  <p>All course assessments will be submitted through Gradescope. We will learn how to use Gradescope together in class, but you can familiarize yourself by watching this video or reading this guide.</p> |
| <p>Desmos (recommended)</p>  <p>To visualize various course concepts, we will use the free and powerful online graphing software called Desmos. Learning how to use Desmos will benefit you throughout the course.</p> | <p>Blackboard (recommended)</p>  <p>All course announcements and content will be posted on Blackboard. You should make sure to read all Blackboard announcements to receive current information about our course.</p> |

Course snapshot

(Read this page for a quick overview of the course structure.)

This is a learning **outcome** (our first one!):

A1 - Functions: I can use functions to study and represent economic concepts such as supply, demand, cost, revenue, profit, and future and present value.

You have a score for each outcome ranging from 0 to 4 indicating how well you've demonstrated that outcome. A score of 4 means you've **mastered** the outcome. There are 15 outcomes in total, split into Units A, B, and C.

You can improve your outcome scores through opportunities and jubilees.

- **Opportunities** are like midterms, and they cover one unit. For example, Opportunity A covers the outcomes from Unit A. Your outcome scores will increase (up to a 4 for each outcome) depending on how well you answer the questions on an opportunity.
- **Jubilees** are like re-takes, and they cover all previous outcomes. For example, Jubilee B covers Units A and B. Higher outcome scores on jubilees replace lower previous scores, but lower scores on jubilees are discarded. You earn the right to see previous outcomes on a jubilee by completing practice problems or prelims (see the section on "[Practice problems, prelims, and credits](#)").

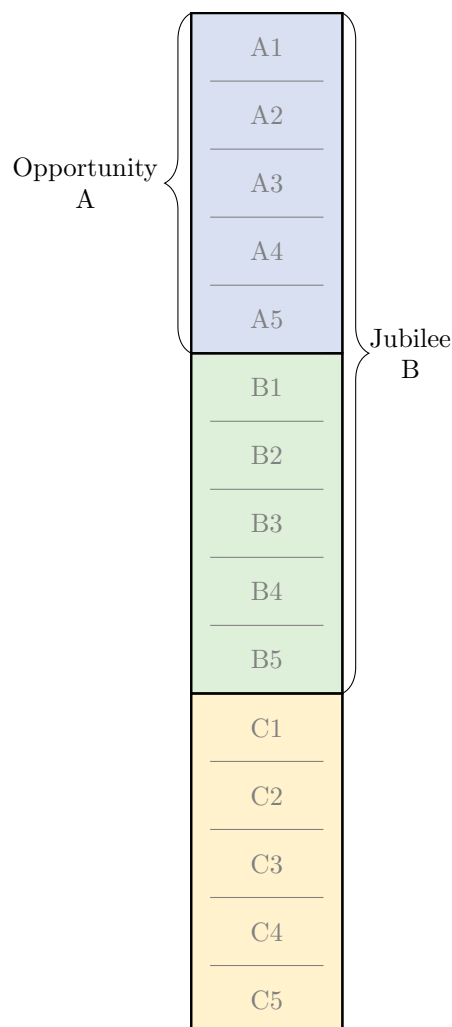
Once you master an outcome, you won't see that outcome again on any subsequent jubilee, but it may appear again on the final.

Your outcome scores are 60% of your grade. The remaining 40% is a combination of your scores on the final and an application. An **application** is a mini-assignment that explores how math is applied to the real-world. These assignments are posted on Blackboard and you can choose to complete at most one, which can be worth up to 10% of your grade. Your grade is then calculated using the following distribution.

| | |
|---|----------------------------|
| Outcome scores (from opportunities and jubilees) 60% | Final + Application 40% |
|---|----------------------------|

Completing an application is optional, because if you choose not to do them, your final will just be worth more.

That's it! As you read the details in the rest of the syllabus, keep this course snapshot in mind.



Learning outcomes

The course will focus on the following 15 learning outcomes. Each learning outcome is a statement of what you will do through a successful completion of the course. The outcomes are split into three units (Units A, B, and C), and each unit will take approximately one month of class time.

| Outcome | Textbook section(s) |
|--|---------------------|
| A1 - Functions: I can use functions to study and represent economic concepts such as supply, demand, cost, revenue, profit, and future and present value. | 1.4, 1.7 |
| A2 - Rates of change: I can compute, compare, and interpret average and instantaneous rates of change of a function. | 1.3, 2.1 |
| A3 - The derivative: I can define the derivative of a function in reference to slope and rate of change, and interpret the derivative's meaning in various contexts. | 2.2, 2.3, 2.5 |
| A4 - The second derivative: I can define the second derivative of a function in reference to concavity, and interpret the second derivative's meaning in various contexts. | 2.4 |
| A5 - Differentiation techniques: I can use differentiation formulas for basic functions in conjunction with the chain, product, and quotient rules to compute derivatives. | 3.1-3.4 |
| B1 - Extrema of functions: I can find the local extrema, global extrema, and inflection points of a function. | 4.1-4.3 |
| B2 - Further applications of the derivative: I can apply derivatives within an economic context to maximize profit, minimize average cost, and find elasticity of demand. | 4.4-4.6 |
| B3 - Multivariable functions: I can use and interpret multivariable function notation, and identify properties of such functions from formulas, tables, and contour diagrams. | 8.1, 8.2 |
| B4 - Partial derivatives: I can define, interpret, and compute partial derivatives of multivariable functions. | 8.3, 8.4 |
| B5 - Extrema of multivariable functions: I can find the extrema of a multivariable function on its whole domain and given a constraint. | 8.5, 8.6 |
| C1 - The integral: I can define and estimate the definite integral of a function using Riemann sums. | 5.1, 5.2 |
| C2 - Interpretations of the integral: I can interpret the meaning of the integral in various contexts. | 5.3, 5.4, 5.6 |
| C3 - The fundamental theorem of calculus: I can explain the relationship between the derivative and the integral and interpret this relationship in a given context. | 5.5 |
| C4 - Antiderivatives: I can find antiderivatives of a given function and use them to compute integrals. | 6.1-6.3, 6.6 |
| C5 - Further applications of the integral: I can apply integrals within an economic context to compute consumer and producer surplus, and study income streams. | 6.4, 6.5 |

Throughout the semester, you will take various in-class assessments to demonstrate your grasp of these outcomes. Each outcome is graded on a scale from 0 to 4, with a 4 representing mastery of the outcome. Each outcome can be assessed multiple times so that a low outcome score on an early assessment can be replaced with a higher score on a later assessment. Your grade at the end of the semester will be determined partially by your outcome scores.

Grading system

This course will use a mastery-based grading system that is designed to keep our focus on the learning outcomes, emphasize deep understanding of concepts, provide multiple opportunities for students to demonstrate mastery of concepts, and accommodate students with varying mathematical backgrounds.

Below is a description of the various assessments that will determine your grade: opportunities, jubilees, applications, and the final. All in-class assessments are timed and must be completed individually.

Opportunities (like midterms): At the end of each unit, you can take an opportunity to demonstrate mastery of that unit's learning outcomes. Opportunities have 5 questions (1 per outcome) and each question is scored from 0 to 4.

Jubilees (like re-takes): About two weeks after an opportunity, you can take a jubilee to improve your scores on outcomes you haven't mastered yet. A higher outcome score on a jubilee will replace your current outcome score. The questions your jubilee contains depend on how many credits you've earned (see the section on "[Practice problems, prelims, and credits](#)" on the next page).

Assessment schedule: The tables below have all of the dates for in-class assessments.

| Date | Assessment | Class |
|------|---------------|-------|
| 2/10 | Opportunity A | Lec. |
| 3/1 | Jubilee A | Lec. |

| Date | Assessment | Class |
|------|---------------|-------|
| 3/24 | Opportunity B | Lec. |
| 4/7 | Jubilee B | Lec. |

| Date | Assessment | Class |
|------|---------------|-------|
| 4/24 | Opportunity C | Lec. |
| 4/28 | Jubilee C | Lec. |

To illustrate how your outcome scores change throughout these assessments, suppose your scores for Outcome A1 on Opportunity A, Jubilee A, and Jubilee B are 2, 1, and 4. The 2 from Opportunity A is not replaced by the 1 from Jubilee A, but it is replaced by the 4 from Jubilee B. You've now mastered A1 and won't see it on any subsequent assessments.

Applications (like an assignment): Applications are mini-assignments that explore how math is applied to the real-world. You can choose to complete at most one application, and if you do, you must discuss your work in office hours to receive a grade. Completing an application is optional, and can be worth up to 10% of your grade. See the "Applications" link on Blackboard for more details.

Final: The final will be comprehensive and is worth 30-40% of your grade, depending on whether you received a score for an application. The date of the final is Wednesday, May 10th, 8-10am. You must take the final to pass the class.

Grade: Your total score (out of 100) will be the sum of your outcome scores as achieved on opportunities and jubilees (out of 60) and your applications + final score (out of 40). Your letter grade will then be determined based on your total score relative to the difficulty of the course. I will send regular progress reports throughout the semester which estimate your projected letter grade.

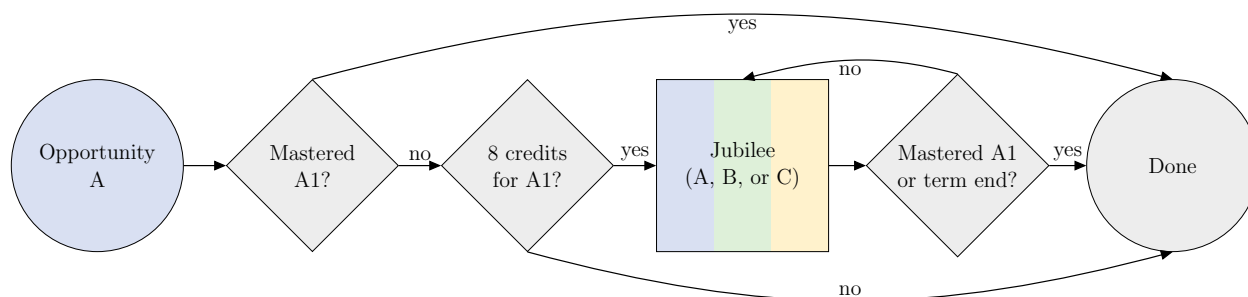
Practice problems, prelims, and credits

Like most skills, mathematical proficiency is gained through practice. Practice in this course contributes nothing directly to your grade, but allows you to earn **credits** which give you extra chances to improve your outcome scores on jubilees. There are two forms of practice: practice problems and prelims.

Each outcome is paired with 10 **practice problems** on Blackboard. These problems are similar to questions on opportunities and jubilees, and you have unlimited chances to answer each practice problem.

You can also earn credits by taking **prelims** (like quizzes) in discussion section. Each prelim is associated to a particular outcome, and consists of one question worth 4 points. Prelims will be released on Gradescope during discussion, and you'll have 10 minutes to work on them. You can work in groups to complete prelims.

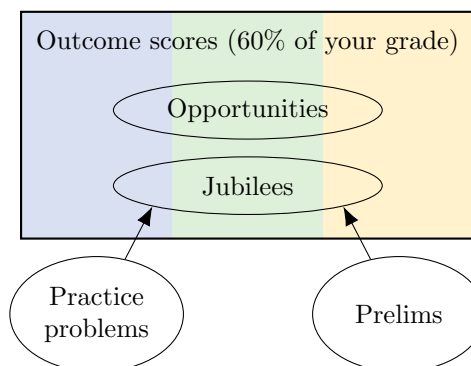
For each outcome, your score on the prelim will be added to the number of practice problems you've completed for that outcome to determine your credits for that outcome. For example, if you answer 7 practice problems correctly for outcome A1, and you get a 3 on Prelim A1, then you'll have 10 credits for outcome A1. If you have earned at least 8 credits for a particular outcome you haven't mastered yet, you will have extra chances to improve that outcome score on all future jubilees. The flow chart below illustrates this process for outcome A1. Notice once you get 8 credits for an outcome, you can try that outcome on all future jubilees without needing to earn 8 more credits.



Due dates: You can complete practice problems whenever you'd like for full consideration (i.e. there are no due dates and no late penalties). However, there are deadlines you must meet if you want your credits to count towards getting extra chances on your jubilees. Due to the logistical challenge of generating and printing each student's personalized jubilee, these deadlines will not be extended.

- To have your practice problems credited to Jubilee A (on 3/1), complete them by 2/26 at 9pm.
- To have your practice problems credited to Jubilee B (on 4/7), complete them by 4/3 at 9pm.
- To have your practice problems credited to Jubilee C (on 4/28), complete them by 4/27 at 9pm.

The diagram to the right emphasizes that practice problems and prelims contribute nothing directly to your grade (notice they are outside of the box), but completing them can give you extra chances to improve your outcome scores on jubilees. They can also help prepare you for opportunities, so even though you don't have to do them before the opportunities, I recommended that you do. In this way, you'll score higher on the opportunities so that you won't have to rely on the jubilees as much. You'll also earn your credits ahead of time, so you won't need to worry about the above deadlines.



Tips for success

Pay attention to your progress reports: You will regularly receive a progress report to help you keep track of your outcome scores, your credits, and what questions you'll see on your next jubilee. Make sure you know how to read this progress report so you can maintain progress toward achieving the grade you want. If you notice a mistake with your progress report, you should reach out to me so I can address it.

Review your scores on Gradescope: When you get back a graded assessment on Gradescope, make sure you understand your mistakes to be ready for the next assessment. If you feel your work has been graded inappropriately, submit a regrade request through Gradescope to have the grader consider your work again. If you receive a 3.5 on a problem, you can correct your mistake via email to improve your score to a 4.

Take lecture seriously: The lectures are designed with interactive components to help you build the conceptual understanding as a basis for problem-solving. We will also have time to practice problem-solving within lecture. Following along with lecture should set you up for success in the course.

Do the practice problems and prelims before the opportunities: Even though you don't have to do any practice to see questions on the opportunities, completing the practice problems and prelims before opportunities will help you perform better. Furthermore, the practice problem deadlines for jubilees are strict, so doing your practice early keeps you from missing those deadlines.

Attend discussion and/or office hours for help with practice problems: The practice problems are challenging, but along with the problems from lecture they represent the best way to prepare for assessments. Working through them alone can be very frustrating. Avoid this frustration by attending discussion and/or office hours to work on these problems with classmates or an instructor.

Devote the appropriate amount of time outside of class: According to the USC Curriculum Office's policy on contact hours, for every one hour of in-class contact time per week, students are expected to complete two hours of out of class work per week. Since we have lecture for 2.5 hours each week, this policy suggests you spend 5 hours each week working on this course outside of class. This time can be spent reviewing lecture notes, completing practice problems and/or applications, and studying for in-class assessments. Try forming a study group that meets regularly to work on math.

Get off to a good start: Try to do well on early assessments (i.e. don't procrastinate). The grading system is flexible but the course moves fast. If you save too many outcomes for later, they will accumulate and the last week of the semester will be a lot of work. If you master a lot of outcomes early on, then you will have fewer to focus on later, so the end of your semester will be easier.

Schedule of lectures

Below is a rough schedule for the course. I will post weekly announcement emails on Blackboard updating you on our progress through the topics for each unit, and any upcoming assessments (i.e. opportunities or jubilees).

| Dates | Lecture topic |
|----------|---|
| 1/9 | Course introduction |
| 1/11-2/8 | Unit A functions, rates of change, the derivative, the second derivative, differentiation techniques |
| 2/10 | Opportunity A |

| | |
|------------|--|
| | Unit B |
| 2/13-3/22 | extrema of functions, further applications of the derivative, multivariable functions, partial derivatives, extrema of multivariable functions |
| 3/24 | Opportunity B |
| | Unit C |
| 3/27-4/21 | the integral, interpretations of the integral, the fundamental theorem of calculus, antiderivatives, further applications of the integral |
| 4/24 | Opportunity C |
| 4/26, 4/28 | Review and Jubilee C |
| 5/10 | Final |

Policies and statements

Attendance and participation: A careful reading of this syllabus reveals that you don't receive any credit toward your grade for attendance or participation. If attending and/or participating in class is helpful for your learning, then you should do it. Otherwise, you should not. Note that for most students (if not all), attendance and participation are helpful and therefore you are encouraged to attend and participate in class.

Hybrid/asynchronous instruction: You can choose to attend live class virtually using the "Zoom" link on Blackboard. You should keep your microphone muted, but you may unmute yourself to ask questions. Your questions should be heard through the classroom speakers. You can also choose to watch recordings of classes also posted on Blackboard using the "Zoom" link.

Missing an assessment: To protect academic integrity, all assessments must be taken in-person on the day the assessment is given in class. Due to the challenge of calibrating the difficulty of an assessment, there are no make-up assessments. If you anticipate missing an in-class assessment, you must inform me with at least 24 hours notice (or in the case of an emergency, as soon as possible given the circumstances). I will then use your performance on the final to act as a stand-in for the missed assessment so that you can still receive an equitable chance to demonstrate the course outcomes.

Incomplete grade: If you miss the final for a documented emergency, you will receive a grade of IN. Consult the Office of Academic Records and Registrar for more information about an IN grade.

Statement on academic integrity: USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Students and disability accommodations: USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once

a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support resources

Office hours

Please stop by to visit me! Office hours are a time for you to ask me about any misunderstandings you have about the course. You can ask for help on practice problems, on applications, and on preparing for opportunities and jubilees. See the first page of the syllabus for my office hours. Some office hours can only be attended in [my personal meeting room on Zoom](#).

Math Center

The [USC Math Center](#) (KAP 263) is a place to go if you want help with your math classes. Please visit the [Math Center website](#) for more information.

Counseling and Mental Health

Phone: (213) 740-9355 (available 24/7)

Website: studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline

Phone: 1 (800) 273-8255 (available 24/7)

Website: suicidepreventionlifeline.org/

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP)

Phone: (213) 740-9355 (24/7, press “0” after hours)

Website: studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)

Phone: (213) 740-5086, Title IX - (213) 821-8298

Website: equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment

Phone: (213) 740-5086 or (213) 821-8298

Website: usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity —Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs

Phone: (213) 740-0776

Website: dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention**Phone:** (213) 821-4710**Website:** campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC**Phone:** (213) 740-2101**Website:** diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency**Phone:** UPC: (213) 740-4321, HSC: (323) 442-1000 (available 24/7)**Website:** dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety**Phone:** (213) 740-6000 (available 24/7)**Website:** dps.usc.edu

Non-emergency assistance or information.