Contemporary Precalculus Syllabus
University of Southern California

Table of contents (For videos explaining the syllabus, visit our course YouTube playlist.)

Course and instructor information

Course ID: MATH 108g
Section: 39403
Units: 4
Term: Fall 2021

Prerequisite: MATH 040
Lecture: MWF, 9-9:50am, CPA 100
Discussion: TTh, 10-10:50am, KAP 147
TTh, 11-11:50am, KAP 147

Instructor: Jared Warner
Office: KAP 256 and Zoom room
Office hours: MWF 1-2pm (in person)
TTh 9-10 (virtual)
E-mail: hjwarner@usc.edu

Teaching Assistant: Inga Girshfeld
Office: USC Math Center, KAP 263
Office hours: T 12-1pm
F 11am-1pm
E-mail: girshfel@usc.edu

Course Description: Equations and inequalities; functions; graphs; polynomial and rational functions; exponential, logarithmic, and trigonometric function; analytic geometry.

Course materials and resources

Textbook (recommended)	Gradescope (required)
Jay Abramson. *Precalculus*, OpenStax. This textbook is available for free download here. You can use this book for supplementary reading, but we won't follow it too closely.	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.
Desmos (recommended)	**MyOpenMath (recommended)**
We will use a free and very powerful online math program called Desmos quite a bit in class. Click here to sign-up for a Desmos account and register for our Desmos class. Our class code is TD5ZKP.	All practice problems are available on the free online platform MyOpenMath. You will access MyOpenMath through Blackboard, so you do not need to create a separate account with MyOpenMath.
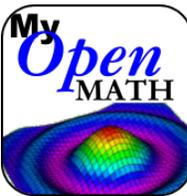
Course snapshot

(Read this page for a quick overview of the course structure. The rest of the syllabus fills in all of the details.)

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

> **A1 - Functions and their graphs:** I can interpret and use mathematical notation and vocabulary related to the concepts of a function and the graph of a function.

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.

- **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.

What if you don't master an outcome on an opportunity? No worries! Take a jubilee!

- **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 so that your outcome scores can never decrease.

Once you master an outcome (i.e. get a score of 4), you won't see that outcome again on any subsequent jubilee, but it may appear again on the final. A strong performance on the final may also boost your outcome scores.

You earn the right to see previous outcomes on a jubilee by completing **practice problems** and/or **participating in lecture**. This means if you do neither, then you can't use jubilees to improve your outcome scores.

Your outcome scores are 60% of your grade. The remaining 40% is a combination of your scores on the final and Calculus Preview. **Calculus Preview** (CP) is an assignment that explores the first few concepts of a calculus class and is completed at your own pace outside of class. Your grade will be calculated using whichever of the following two distributions gives you a higher score.

Outcome scores 60%		Final 40%

or

Outcome scores 60%		CP 10%	Final 30%
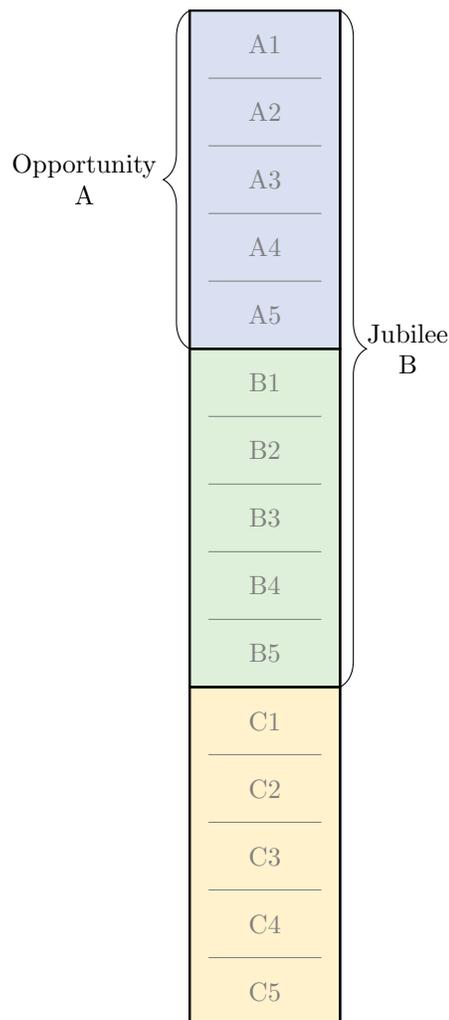
Completing Calculus Preview is optional, because if you choose not to do it, your final will just be worth more.

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 and their graphs: I can interpret and use mathematical notation and vocabulary related to the concepts of a function and the graph of a function.	1.1 - 1.3
A2 - Composition, transformation, and inversion: I can construct new functions from given functions through composition, transformation, and inversion.	1.4, 1.5, 1.7
A3 - Linear functions: I can write and graph linear functions and use them to model relationships between quantities in a given context.	2.1-2.3
A4 - Exponential and logarithmic functions: I can write and graph exponential and logarithmic functions, and simplify and evaluate logarithmic expressions	4.1 - 4.5
A5 - Exponential equations and modeling: I can solve exponential and logarithmic equations, and model various natural phenomena using exponential functions.	4.6, 4.7
B1 - Quadratic functions: I can write and graph quadratic functions in various forms, and find their vertices and roots.	3.1, 3.2
B2 - Polynomial functions: I can write and graph polynomial functions, identify their end behavior, and use technology to find their local extrema.	3.3, 3.4
B3 - Zeros of polynomial functions: I can find rational and complex zeros of polynomials functions by hand.	3.5, 3.6
B4 - Rational functions: I can write and graph rational functions, and find their domains, zeros, and asymptotes.	3.7
B5 - Analytic geometry: I can write equations describing ellipses, hyperbolas, and parabolas, and graph them, identifying their important features.	10.1 - 10.3
C1 - Unit circle trigonometry: I can use the unit circle to find the values of trigonometric functions at a given angle measured in degrees or radians.	5.1, 5.2, 5.3
C2 - Right triangle trigonometry: I can evaluate trigonometric functions at acute angles in right triangles and solve applied problems involving right triangles.	5.4
C3 - Graphs of trigonometric functions: I can graph the six basic trigonometric functions and their transformations by hand.	6.1, 6.2
C4 - Trigonometric equations and identities: I can use trigonometric identities to simplify expressions, evaluate trigonometric functions, and solve trigonometric equations.	7.1 - 7.3, 7.5
C5 - Polar form of complex numbers: I can efficiently find products, quotients, powers, and roots of complex numbers using their polar forms.	8.3, 8.5

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, Calculus Preview, and the final. All in-class assessments are timed and completed individually but you may use a scientific calculator (such as a TI-30X). No graphing calculators are allowed.

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 and credits" on the next page).

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

Date	Assessment	Class
9/24	Opportunity A	Lec.
10/7	Jubilee A	Disc.

Date	Assessment	Class
10/27	Opportunity B	Lec.
11/9	Jubilee B	Disc.

Date	Assessment	Class
11/30	Opportunity C	Disc.
12/3	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.

Calculus Preview (like an assignment): Calculus Preview is an assignment from the last chapter of our textbook that covers beginning calculus concepts. Completing Calculus Preview is optional, and can be worth up to 10% of your grade. See the section below on Calculus Preview for more details.

Final: The final will be comprehensive and is either worth 40% of your grade, or 30% with your Calculus Preview score worth the other 10% (whichever of these two options gives you a higher grade). The date of the final is Monday, December 13th, 11am-1pm. 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 prelims, opportunities, and jubilees (out of 60) and your Calculus Preview + final score (out of 40). The table below shows the lowest letter grade you can receive for a given total score. For example, if your score is an 83, you are guaranteed a B, and perhaps a higher grade depending on your performance relative to other MATH 108 students.

| A 93 to 100	A- 90 to 92	B+ 87 to 89	B 83 to 86	B- 80 to 82	C+ 77 to 79
C 73 to 76	C- 70 to 72	D+ 67 to 69	D 63 to 66	D- 60 to 63	F 0 to 59

Practice problems and credits

Like most skills, mathematical proficiency is gained through practice. Each outcome is paired with 10 practice problems from MyOpenMath. These problems are similar to questions on opportunities and jubilees. Practice problems contribute nothing to your grade, but they allow you to earn credits which give you extra chances to master outcomes you missed on previous opportunities. You can also earn credits by participating in lecture (see the section below on "Lecture preparation and participation").

You have unlimited chances to answer each question on MyOpenMath, and each question you answer correctly is worth 1 credit for the associated outcome. For example, if you answer all 10 questions correctly on the MyOpenMath assignment for outcome A1, then you'll have 10 credits for outcome A1.

If you have earned at least 10 credits for a particular outcome you haven't mastered yet, you will have an extra chance to master that outcome on all future jubilees (recall that you've mastered an outcome when your score for that outcome is 4). The flow chart below illustrates this process.
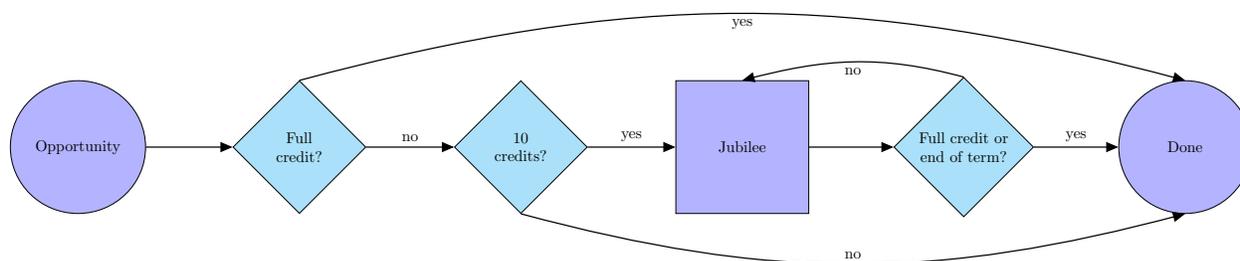
Due dates: You can complete practice problems whenever you'd like for full consideration (i.e. there are no due dates and no late penalties). However, there are deadlines you must meet if you want your credits to count towards getting extra chances on your jubilees.

- To have your practice problems credited to Jubilee A (on 10/7), complete them by 10/5.
- To have your practice problems credited to Jubilee B (on 11/9), complete them by 11/7.
- To have your practice problems credited to Jubilee C (on 12/3), submit your work by 12/1.

Lecture preparation and participation

This class will be taught using a "flipped classroom" approach. This means that instead of being introduced to new content in lecture and practicing that content outside of lecture, you'll have the option of learning new content outside of lecture and then practicing that content in lecture.

How to prepare for lecture: Lectures will have a corresponding Desmos activity posted on our Desmos class. You should work through the first part of this Desmos activity before lecture.

- Screen 1 will have a review problem to attempt that relates to the topic from the previous lecture.
- Screen 2 will have an instructional video for you to watch that introduces a new mathematical topic. Each video has a few study questions to consider as you watch.
- Screen 3 will have an applet for you to interact with that relates to the video.
- Screen 4 will have an opening example problem to try using what you learned from screens 2 and 3.

Some activities may not have a review problem or applet, in which case there may be fewer screens to work through on your own before lecture. The remaining screens of the Desmos activity will contain class problems.

How to participate in lecture: You may volunteer to share your work for any problem we solve in class. As an incentive to volunteer, you will earn 5 credits for the relevant outcome. However, you will not receive 10 practice credits for a single outcome by volunteering twice, as this would allow you to avoid doing any of the practice problems for that outcome.

A note about participation: Notice that participation is not compelled, only incentivized. If you volunteer to solve a problem, your reward is that you can do less practice problems to earn your jubilee questions, but if you prefer not to volunteer, then you can still earn your jubilee questions just by doing more practice problems

There are many different ways to participate in a class, each suited to different personality types and different learning styles. You should identify the type of participation that will help you learn best and engage with our class in whatever way that is. Be mindful, however, that the type of participation you're most comfortable with is not necessarily the type of participation that will help you learn the best. In other words, you are encouraged to at least explore participating in ways that are outside of your comfort zone.

Calculus Preview (optional)

The Calculus Preview is a list of textbook problems from Chapter 12, which is titled "Introduction to Calculus." These problems have been selected for those students who wish to see the content that will be covered in the first few weeks of MATH 125. Working on the Calculus Preview is optional. Your grade will be calculated by weighting your final at 40%, or by weighting your final at 30% and your Calculus Preview work at 10%, whichever weighting gives you a higher grade.

If you would like to work on the Calculus Preview, write up solutions to the 10 problems in the table below (including screenshots of a Desmos graph for each problem as described in the table) and submit your written solutions and graphs to Gradescope.

Here are some guidelines to keep in mind if you choose to work on the Calculus Preview.

- We won't devote any lecture time to cover Chapter 12, so to solve some of these problems you may have to read Chapter 12 on your own.
- You may use any resource for help, but your solutions should represent your own understanding.
- Calculus Preview solutions will be graded on four drop-off dates throughout the semester (10/18, 11/3, 11/19, and 12/8), and you can edit and resubmit solutions for regrading if you don't get full credit.
- You don't have to submit all 10 solutions at once. You can submit a few solutions at a time.
- For full credit, the windows of your graphs should be appropriately adjusted, and the domain of the functions should be restricted to reasonable values. You can watch this video for a brief tutorial on how to make Desmos graphs.
- Calculus Preview solutions are graded for correctness and quality. Since you are allowed to resubmit for full credit, full credit will only be awarded for very high quality solutions.

Problem	Topic	Description of graph to include in your solution
§12.2, 21	Evaluating limits by rationalization	Graph the given function near the point $x = 0$ to support your answer. Label any holes with an open circle.
§12.2, 27-29	Evaluating one-sided limits	Graph the given function (which is the same in all three problems) near the point $x = 4$ to support your answers. Label any holes with an open circle.
§12.2, 30	Evaluating limits by factoring and canceling	Graph the given function near the point $x = 2$ to support your answer. Label any holes with an open circle.

§12.3, 27	Finding points of discontinuity	Graph the given function on a domain that includes all points of discontinuity. Label any holes with an open circle.
§12.3, 36	Building a continuous piecewise defined function	Graph $f(x)$ for three choices of b and c: one that makes $f(x)$ discontinuous only at $x = 1$, one that makes $f(x)$ discontinuous only at $x = 3$, and one that makes $f(x)$ continuous everywhere.
§12.3, 48	The downfalls of technology	Graph $f(x)$ and label its discontinuity.
§12.4, 7	The derivative of a linear function	Graph $f(x)$ and $f'(x)$ on the same pair of axes.
§12.4, 10	The derivative of a quadratic function	Graph $f(x)$ and $f'(x)$ on the same pair of axes.
§12.4, 28	The tangent line of a function at a point	Graph $f(x)$ and the tangent line of $f(x)$ at $x = 9$.
§12.4, 51-55	Interpreting the derivative	Graph $s(t)$, and the tangent lines at $t = 2$ and $t = 3$. Label the points corresponding to $t = 0, 2, 3$ and 5.

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.

Learn from your mistakes: When you get back a graded assessment, make sure you understand every mistake you made, and practice solving those problems again to be ready for the next assessment.

Take lecture preparation and participation seriously: Keep up with the pace of the course and the flipped classroom approach by reviewing the Desmos activities before lecture. The Desmos activities and their problems are designed to set you up for success on the opportunities. The best way to prepare for opportunities is to prepare for and participate in lecture.

Attend discussion and/or office hours for help with practice problems: The MyOpenMath 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 preparing for lecture, completing practice problems and/or Calculus Preview, and studying for in-class assessments.

Work and study in groups: Learning can be both an individual and social endeavor. You'll need to be intentional to benefit from learning in groups. To this end, you are encouraged to work with a group in lecture and discussion to solve problems in class. Even better, form a study group that meets regularly outside of class to work on math.

Get off to a good start: Try to do well on early assessments. The grading system provides for flexibility but the course will move fast. If you save too many outcomes for later, they will accumulate. If you improve your scores as much as you can in the beginning, then you will have fewer outcomes to focus on later in the semester.

Schedule of lectures

Below is a tentative schedule for the course lectures. Amendments to this schedule will be announced on Blackboard. The course calendar on Blackboard includes the topics for discussion sections.

Dates	Lecture topic
8/23	Course introduction
8/25, 8/27	Functions and their graphs
8/30, 9/1, 9/3	Composition, transformation, and inversion
9/8, 9/10	Linear functions
9/13, 9/15, 9/17	Exponential and logarithmic functions
9/20, 9/22	Exponential equations and modeling
9/24	Opportunity A
9/27, 9/29	Quadratic functions
10/1, 10/4, 10/6	Polynomial functions
10/8, 10/11	Zeros of polynomial functions
10/13, 10/18	Rational functions
10/20, 10/22, 10/25	Analytic geometry
10/27	Opportunity B
10/29, 11/1, 11/3	Unit circle trigonometry
11/5, 11/8	Right triangle trigonometry
11/10, 11/12, 11/15	Graphs of trigonometric functions
11/17, 11/19	Trigonometric equations and identities
11/22, 11/29	Polar form of complex numbers
11/30	Opportunity C (in discussion)
12/1	Review
12/3	Jubilee C
12/13	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.

No makeups or late submissions: There are no makeup opportunities or jubilees. The course is already designed to give many chances to demonstrate mastery of course outcomes, so if you miss one chance you should focus on taking advantage of the next one.

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.

Statement for students with disabilities: Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor (or the teaching assistant) as early in the semester as possible. DSP is located in GFS 120 and is open 8:30 a.m.–5:00 p.m., Monday through Friday.
Website: https://dsp.usc.edu/
Contact information: (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) dspfrontdesk@usc.edu.

Support resources

Office hours
Please stop by to visit me! Office hours are a time for your to ask me about any misunderstandings you have about the course. You can ask for help on practice problems, on assignments, and on preparing for opportunities and jubilees. On MWF I will be in KAP ???, and on Tuesdays and Thursdsays 9-10pm I will be 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 Saftey

Phone: (213) 740-6000 (available 24/7)

Website: dps.usc.edu

Non-emergency assistance or information.