Course Instructors
Dr. Konstantina Christodouloupoulou
Office Hours: M8, W6, F4 or by appointment in LIT 370 for UF on-campus students and by appointment through CANVAS Conferences for UFO students.

Email: kchristod@ufl.edu

Teaching Assistant (TA)
Ms. Carol Demas
Online Office Hours: 6-7PM on Monday and Wednesday through Conferences in CANVAS
Email: demasc@ufl.edu

The course homepage is located in e-Learning CANVAS, http://elearning.ufl.edu/.
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<td>LQ22-23</td>
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<td>LQ24-26</td>
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<td>9 FinalR FINALEXAM (L1-37)</td>
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<tr>
<th>Red color</th>
<th>indicates exam dates (in Canvas). All exams are open from 5-10PM EST.</th>
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<tr>
<td></td>
<td>You should schedule with ProctorU at least a week in advance for a 120 minutes time block for each unit exam and 150 min for the final exam.</td>
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<tr>
<td>Green color</td>
<td>ExamR indicates optional exam review assignments due 11:59PM EST (in WebAssign)</td>
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<td>Blue Color</td>
<td>indicates the due dates of required graded assignments on 11:59PM EST (in WebAssign).</td>
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<td>LQ: Lecture Quiz due by 11:59PM EST</td>
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1. INTRODUCTION

1a COURSE CONTENT: MAC 2312 is the second semester of the three-semester calculus sequence. Topics covered include techniques of integration, improper integrals, infinite sequences and series, power series, and their applications, parametric equations, polar coordinates and polar equations of plane curves and applications of definite integrals including volumes of solids and solids of revolution. Knowledge of this subject matter is essential for those wishing to pursue studies in mathematics, engineering, sciences or a host of other fields.

A minimum grade of C (not C−) in MAC 2311 satisfies four credits of the university General Education Math requirement.

This is an ONLINE VERSION of MAC2312—all content is delivered online. Students view 37 online lecture videos and complete lecture questions/quizzes in the course management system Canvas and complete online homework using WebAssign (WA) software. Students are encouraged to post questions and answers on the course Discussion Board in Canvas. Three semester unit exams and a cumulative final exam are posted in Canvas and administered through ProctorU.

1b PREREQUISITES: MAC2312 assumes that you have essential PreCalculus (MAC1147 Algebra and Trigonometry) and Calculus I (MAC2311) skills necessary to succeed in this course. Students should be able to do the work without a calculator. In the last section of this syllabus, students may find a short list of review materials to practice. A grade of C in UF MAC2311 meets the minimum requirement for the course. We encourage students to review the prerequisite material to gain a strong knowledge in order to succeed in calculus II. A Diagnostic quiz in WebAssign is due on the date in the calendar. You should already be competent in working this material. We recommend students who are having difficulty with the review material or the Diagnostic quiz consider first taking MAC2311 (if you have not done so) which is offered as an UF online course. You may switch courses on ISIS, isis.ufl.edu, during the drop-add period. Students may also use the ALEKS Remedial Program to strengthen pre-calculus skills. For more complete information on ALEKS, check the page isis.ufl.edu/aleksinfo.html.

1c REQUIRED MATERIALS:

Textbook: The textbook for the course is Calculus Early Transcendentals, by James Stewart (8th Edition).

WebAssign Access Code: It includes an access to the Stewart ebook and the online homework assignments. WebAssign (WA) provides a two-week grace period to use the online homework system before you must purchase an access code.

To purchase a WA access code:

- You have the choice to "opt-in" to WA access and the e-book through CANVAS once classes begin for a reduced price of $62.50 and pay for these materials through your student account. The deadline to opt-in is Sept. 8.
- Students who already have purchased a multi-term access for Stewart text prior to this semester should not have a problem accessing our class on WA. If you have any issues regarding your multi-term access, contact WA Support, 1800-955-8275.

Computer Access and Requirements: All assignments should be taken on a computer, not cell phone or tablet, since there may be compatibility issues with CANVAS and WA. Be sure you are using a browser that works with WA. Any WebAssign questions should be directed to your TA and/or the WebAssign Student Support, https://webassign.com/support/student-support/. You
should not wait till last minute to complete your online assignment to avoid any last minutes issues. For WA browser recommendations, click here, http://www.webassign.net/manual/student_guide/c_a_system_requirements.htm

You are responsible for having access to a working computer and have your work completed on time. Complete and submit your work early. If you wait and run into any difficulties to submit your work, you will be out of luck.

NO CALCULATORS are allowed on quizzes or on the exams. A graphing calculator and Wolframalpha are useful as a study and learning tool when used appropriately, but are not essential. Remember that Calculus is a collection of ideas that are not mastered through calculator skills.

COURSE CALENDAR: Check the course calendar for due dates and plan your schedule accordingly.

1d CANVAS: UF Online’s course management system, is accessed through elearning.ufl.edu. All course information including the course homepage, syllabus, and exam information are posted on this site. In addition, there is a mail tool and discussion forum for communication.

All grades are posted in Canvas (except individual WebAssign homework and quiz scores which are accessed in your WebAssign gradebook). You are responsible for verifying that those grades are accurate. You have one week after a score has been posted to resolve any grade concerns by contacting your TA. We will not consider these grade disputes at the end of the semester. Please note: Important course information is clearly communicated in this course guide and assignments and course materials are easily accessible through the CANVAS modules. If you cannot find your answer in the resources above, there is also a Discussion Forum available in Canvas. Please use this to post questions and to supply answers to your fellow students. Your instructor will check the discussion forum regularly.

BE SURE TO TURN ON the ALERTS from Canvas so you get timely course information.

1e LECTURE VIDEOS: The lecture and additional example videos provide the main presentation of course material, and are accessed through the CANVAS modules. To stay current with the course, we recommend watching the videos weekly following the schedule posted on the course calendar. You should watch the lectures and answer the corresponding Lecture Quiz Questions before attempting homework. You may contact your instructor or post questions on the course discussion board if you need clarification of a topic. The Broward Teaching Center at UF provides online support and is a valuable resource.

It is possible to get ahead in this class if you complete each assignment early. If you have other commitments, adjust your schedule to complete the assignments earlier rather than later. However, the test dates will NOT be extended.

Lecture notes outlines: You can download and print them out from each module page in Canvas. Or you have an option to purchase the printed outlines from the Target Copy Center (ask for the MAC 2312 Online Course Packs) or place your order online at http://target-copy.com/course-packs/. It is important that you should have a hard copy of the lecture notes in order to follow the lecture easier when watching the videos.

1f SUCCESS: I want you to be successful in this class, I am on your side and will be working hard to make sure you always have the resources to have a clear path to success. But I cannot walk that path for you! It will take considerable effort on your part. Other than having a strong precalculus and calculus I background, success in MAC 2312 depends largely on your attitude and effort. Keeping up with the videos is critical. You may find it beneficial to work daily on the material as opposed to saving it all for one day. It is not effective to watch video and copy notes
without following the thought processes involved in the lecture. For that reason, there are Lecture Quizzes following each lecture which you will answer in CANVAS as part of your course grade.

Be aware that much of the learning of mathematics at the university takes place outside of the lecture. You need to spend time reviewing the concepts of each lecture from the video and the e-book before you attempt homework problems. It is also important to look over the e-book sections to be covered in the next lecture to become familiar with the vocabulary and main ideas before watching the next video. That way you will be better able to grasp the lecture material.

As with most college courses, you should expect to spend a minimum of 3 hours working on your own for every credit hour of the class. MAC 2312 is a 4 credit course, which means at least 12 hours per week preparing for and practice problems for this course and additional hours spent watching the lecture videos. Keep in mind that the goal is to be able to apply the techniques of calculus to problems, not just reproduce the problems you see in the class.

Do you know that it takes roughly 42 lecture hours in colleges vs. roughly142 lecture hours in high school to complete a calculus course? The fact of the matter is that college course goes 3+ times faster and that you probably won’t do well if you don’t watch lecture regularly or wait till the week of the exam to start preparing for the exam. Therefore, it is critical that you keep pace with the course material and assignments. Do not fall behind. Use the resources available as you study!

We encourage you to ask questions on the Discussion Board, seek help from your teaching assistant (TA) and the instructor, and the Broward Teaching Center, www.teachingcenter.ufl.edu, for live and online tutoring services. WA also offers videos and other teaching aids. Do not let misunderstandings go unanswered.

We encourage students to work together, and an important resource to facilitate communication in an online course is the MAC2312 Discussion Board in CANVAS. You should check the Discussion Board regularly, posting questions and answers for fellow students. The effort of asking questions and communicating ideas clearly, as well as the practice of writing solutions, are effective tools in helping you better understand calculus concepts. This is YOUR forum, take advantage of it by participating in it.

In studying calculus, you must be careful not to let a tutor, friend or calculator "think" for you. Be sure that you can work problems completely on your own, answer any questions others have posted, without help, by the time of a quiz or an exam.

It is our hope that through focused study and practice you will gain a true appreciation for the important concepts of calculus and their application. We want you to succeed in this class! You must be positive and keep up with the course material and take the initiative to get help in time, before you get too far behind. Students with a positive attitude who are intellectually engaged in learning the material will get the most from the course.

1h STUDENTS WITH LEARNING DISABILITIES: Students requesting class and exam accommodations must first register with the Dean of Students Office Disability Resource Center(DRC), https://www.dso.ufl.edu/drc/. The DRC will provide a documentation letter to the student who must then provide this letter to the course coordinators during office hours when requesting accommodation. This should be done as early as possible in the semester, at least one week before the first exam and adhering to DRC deadlines, so there is adequate time to make proper accommodations.

1i ACADEMIC HONESTY: Remember that you committed yourself to academic honesty when you registered at the University of Florida. All students are bound to
The Honor Pledge
We, the members of the University of Florida community, pledge to hold ourselves and our peers
to the highest standards of honesty and integrity by abiding by the Honor Code. On all work
submitted for credit by students at the University of Florida, the following pledge is either required
or implied:
“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

Academic Honesty Guidelines: “All students are required to abide by the Academic Honesty
Guidelines which have been accepted by the University. The academic community of students
and faculty at the University of Florida strives to develop, sustain and protect an environment of
honesty, trust, and respect. Students are expected to pursue knowledge with integrity. Exhibiting
honesty in academic pursuits and reporting violations of the Academic Honesty Guidelines will
encourage others to act with integrity. Violations of the Academic Honesty Guidelines shall result
in judicial action and a student being subject to the sanctions in paragraph XIV of the Student
Code of Conduct.”

The Mathematics Department expects you to follow the Student Honor Code. We are bound
by university policy to report any instance of suspected cheating to the proper authorities. This
includes clicker points submitted in lecture. Each student must enter his or her own
response; clicking for another student is a violation of the Academic Honesty Guidelines
and will be reported.

You may find the Student Honor Code and read more about student rights and responsibilities
concerning academic honesty at the link https://www.dso.ufl.edu/scrr/. In addition, we
remind you that lectures given in this class are the property of the University/faculty member
and may not be taped without prior permission from the lecturer and may not be used for any
commercial purpose. Students found to be in violation may be subject to discipline under the
Student Conduct Code.

2. TESTING

There are three semester unit exams and one cumulative final exam given in CANVAS on the dates
shown on the course calendar and administered through ProctorU. You must register with ProctorU at
http://go.proctoru.com for each exam at least 1 week prior to the exam date to schedule a 120
(90+extra 30) minutes time block for each unit exam and a 150 (120+30) minutes block for the final.
All exams are open from 5 –10PM EST only.

We urge you to connect to Proctor U Help Desk representatives, at least a few days prior to your
exam, http://www.proctoru.com/testitout and do a live chat via "Connect to a live person" to
confirm your connect and equipment are all good. It is your responsibility to be sure that you
have a reliable internet connection and verify with the proctor for an acceptable location &
environment to ensure that it meets proctoring requirements. Go to http://www.proctoru.com
for more details.

2a SEMESTER EXAMS: Each semester exam will be scored on a scale of 0 to 70 points and consists
of 20 questions. You will see your score after submitting the exam and you may request an online
conference (UFO students) or visit instructor’s office hours (residential students) to review your
exam within one week of the exam.

2b FINAL EXAM: A mandatory, cumulative final exam offered in CANVAS will be given on the date
shown in the course calendar. The exam is graded on a scale of 0 to 90 points.
Note: You may NOT use a calculator or any other study aid for exams. Be sure to read the ProctorU handout thoroughly to understand the exam procedures before you start a test.

Make sure you are available to take the exam at the designated date and time. Missing an exam due to negligence will result in a minimum 10-point penalty.

2c IMPORTANT EXAM POLICIES: MAC 2312 requires that students take evening exams through ProctorU online on the listed dates. There are no exceptions to this. Students with conflicts, including regularly scheduled classes, work, or travel, must make advance arrangements to take the test at the listed dates and times.

The following applies to all exams:

(1) Students are responsible for material covered in lectures, NYTI, and assignments. Exam coverage and format may vary from semester to semester.

(2) Bring only the following to the exam ProctorU: two picture IDs (UF Gator One card and your state driver’s license) with a legible signature and blank scratch paper. No calculators are permitted. Cell phones and other electronic devices must be turned off and out of sight. If any such device rings, buzzes, or otherwise causes a distraction during the exam, your test will be considered to be compromised and your test score will be 0.

(3) ProctorU recommends students to connect with them (https://test-it-out.proctoru.com/) few days before an exam to check for any internet connection issues and computer compatibilities.

See Section 3f for Makeup Policies.

3. GRADING

3a COURSE GRADE: Your course grade is based on 400 points accumulated as follows:

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<tr>
<td>Lecture Quizzes</td>
<td>40</td>
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<td>WebAssign assignments</td>
<td>60</td>
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<td>(&gt;60 possible points)</td>
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<tr>
<td>Semester exams</td>
<td>210</td>
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<td>(70 points × 3=210)</td>
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<tr>
<td>Cumulative Final exam</td>
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The total sum of points is your numerical score, which will be converted to a letter grade according to the following scale.

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<tr>
<th>Letter Grade</th>
<th>Points Range</th>
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<tr>
<td>A</td>
<td>360 - 400 pts</td>
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<tr>
<td>A−</td>
<td>348 - 359.999 pts</td>
</tr>
<tr>
<td>A−</td>
<td>320 - 333.999 pts</td>
</tr>
<tr>
<td>B+</td>
<td>334 - 347.999 pts</td>
</tr>
<tr>
<td>B</td>
<td>294 - 307.999 pts</td>
</tr>
<tr>
<td>B−</td>
<td>294 - 307.999 pts</td>
</tr>
<tr>
<td>C+</td>
<td>294 - 307.999 pts</td>
</tr>
<tr>
<td>C−</td>
<td>268 - 279.999 pts</td>
</tr>
<tr>
<td>C−</td>
<td>254 - 267.999 pts</td>
</tr>
<tr>
<td>D+</td>
<td>228 - 239.999 pts</td>
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<tr>
<td>D</td>
<td>240 - 253.999 pts</td>
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<tr>
<td>D−</td>
<td>228 - 239.999 pts</td>
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<tr>
<td>E</td>
<td>0 - 227.999 pts</td>
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The course grade is determined by the number of points you have, not by the percentage, and will be strictly enforced. There will be no additional curve in this course, and extra assignments for individual students to improve a grade are NOT possible.
*NOTE: A grade of C− DOES NOT give Gordon Rule or General Education credit!
For those taking the S-U option: S [305 - 450 points] U [0 - 304.999 points]

We will not review disputed points at the end of the semester. All grade concerns must be settled within one week of the submission.

3b VIDEOS and LECTURE QUIZZES: MAC2312 is organized into 37 lectures in Canvas, each lecture has an introductory page including the concepts to be covered, things you need to do for this lecture. From there, you may link to the lecture videos, a copy of the note outlines for each lecture. Viewing the video is an important aspect of the learning process. There are several lecture questions in each Lecture Quiz to be completed at the end of each lecture. You will earn points by completing lecture questions by the specified due date. You should work these problems after you watch the lectures and then enter your answers directly in Canvas. We encourage you to use the text as well as the videos or the discussion board to help answer these questions. These questions pertain to the concept recently covered. It is best to do them as soon as possible. Post questions on the course discussion board if you need clarification of a topic. The Broward Teaching Center at UF provides online homework support and is a valuable resource.

3c WEBASSIGN ONLINE HOMEWORK: Online homework administered in WebAssign is planned to review concepts and provide practice of the lecture material. The homework problems are graded by the software and you see your score immediately after submitting your work. You will have limited submissions for each problem, there are aids and a link to the e-text to help you solve questions.

NOTE: Always read the Description and Instruction displayed in the beginning of each assignment.

When working in WA, you are advised to always click the "SAVE" button to save your answers, this does not reduce the number of submissions allowed, but helps your TA to retrieve your last saved answers in case there are internet troubles or if you forget to submit your answers.

Do not try to complete an assignment in one sitting; start early instead of waiting until the due date to avoid missing the deadline.

The WebAssign Homework is open book and open note. If you are experiencing a problem with logging in, registration, or WebAssign in general, please contact WebAssign Support. Their contact information is on their homepage. Get the trouble shoot ticket number and email your TA immediately after this. NOTE: WebAssign Homework and Lecture Questions account for 100 points of your total course score, to reflect their importance in understanding course concepts. Your total WA homework will count up to a maximum of 60 points, but the total points available are higher to offset possible credit lost due to technical difficulties.

3d EXAMS: Three semester exams and a cumulative final exam are given online in CANVAS administered by ProctorU. Your exam grade will be available in CANVAS gradebook once your exam is submitted. The MAC 2312 exams are not released to students, but you may request an online conference (UFO students) or visit instructor’s office hours (residential students) to review your exam within one week of the exam.

3e EXTRA CREDIT: You may earn additional points in the following ways:

- SYLLABUS QUIZ (3 points): In CANVAS you will find the Start Here page. Watch the introductory video and read the syllabus. After you feel comfortable with the course policies listed, take the syllabus quiz posted in Canvas.
• WEBASSIGN DIAGNOSTIC QUIZ (2 points): This quiz provides a review of precalculus and Calculus I skills. It is posted in WebAssign.

• COURSE PARTICIPATION (8 points): We encourage you to utilize instructor’s virtual office hours and the MAC 2312 Discussion Board regularly to ask and answer questions about course material and homework. You can earn up to 4 bonus points to participate in virtual office hours and up to additional 4 points by posting questions and responding to other students’ posts. Questions must be appropriate and relate to course material to earn credits.

• EXAM PREPARATION (12 points): Before each of the exams an Exam Review will be open in WA for practice and extra credit. The review will have a flavor of the type of questions you will see on the actual exam. It is not timed, you have limited submissions per question and must be submitted by the due date. See course calendars.

3f MAKE-UP POLICIES and EXTENSIONS :

• EXTENSIONS ON WEBASSIGN HOMEWORK: While it is a much better strategy to work ahead, occasionally you may fall behind. You can request an extension on WebAssign homework within 1 day after the deadline and you will have 24 hours to complete it after extension request. The extension must be submitted in WebAssign directly. However, there will be a 20% grade penalty for those problems completed after the original due date for the assignment.

• MAKE-UP LECTURE QUIZZES: There are extra points available in lecture quizzes so we do not offer make-ups.

• MAKE-UP EXAMS: To be eligible for a make up, you must have signed up with the TA at least two weeks prior to the exam date (unless last minute emergency) with valid documented UF approved excuses and have completed at least 80% of the course assignments and have not missed any exams so far. Please consult with your TA.

If illness or other last minute extenuating circumstances cause you to miss an exam, you must contact your TA within 24 hours of the exam with a valid documentation for approval to reschedule the exam with ProctorU. The eligibility requirement stated above still applies.

• OTHER MAKE-UPS: There are no make ups on the Diagnostic Quiz, Syllabus Quiz, Discussion Board Posts, Exam Reviews and extra credit opportunities.

We do not accept any late excuse documentation. Assignments and Exams will not be reopened, reviewed, offered or graded after the last day of the semester. You must immediately report to your TA any problems with any assignments after you have tried to request the appropriate help and get the confirmation number of such requests.

The make up exam for a semester exam, if approved, is on the last Wednesday of the semester, administered by ProctorU. You are responsible to schedule it at least 1 week prior with ProctorU.

3g INCOMPLETE: A student who has completed a major portion of the course with a passing grade but is unable to complete the final exam or other course requirements due to illness or emergency may be granted an incomplete, indicated by a grade of “I”. This allows the student to complete the course within the first six weeks of the following semester. The student must contact the course coordinator before finals week to sign an incomplete grade contract (http://clas.ufl.edu/forms/incomplete-grade-contract.pdf), and must provide documentation of the extenuating circumstances preventing him or her from taking the final exam. The grade of “I” is never used to avoid an undesirable grade, and does not allow a student to redo work already graded or to retake the course. See the official policy at http://www.math.ufl.edu/department/incomplete-grades/.
4. GENERAL EDUCATION INFORMATION

MAC 2312 has been designated a General Education course that can be counted towards the Mathematical Science (M) requirement. **Course Objective**- The General Education Objectives for Mathematics courses:

"Courses in mathematics provide instruction in computational strategies in fundamental mathematics including at least one of the following: solving equations and inequalities, logic, statistics, algebra, trigonometry, inductive and deductive reasoning. These courses include reasoning in abstract mathematical systems, formulating mathematical models and arguments, using mathematical models to solve problems and applying mathematical concepts effectively to real-world situations."

The primary goal of the course is to help students understand and apply the fundamental principles of differential and integral calculus. These objectives are accomplished through the lectures, homework, quizzes and discussion sections.

**Student Learning Outcomes (SLOs)**- The general education student learning outcomes describe the knowledge, skills and attitudes that students are expected to acquire while completing a general education course at the University of Florida.

**I. Content**: Content is knowledge of the concepts, principles, terminology and methodologies used within the discipline. Students demonstrate competence in the terminology, concepts, theories and methodologies used within the discipline.

- Explore some of the applications of the definite integral by using it to compute areas between curves, volumes of solids, and length of a curve.
- Develop techniques for using basic integration formulas to obtain indefinite integrals of more complicated functions.
- Understand the definition of infinite sequences and series and determine whether a sequence/series converges or diverges.
- Understand parametric equations and polar equations with Calculus.

**II. Communication**: Communication is the development and expression of ideas in written and oral forms. Students communicate knowledge, ideas and reasoning clearly and effectively in written and oral forms appropriate to the discipline.

- Communicate mathematical findings clearly and effectively using written and/or graphic forms.

**III. Critical Thinking**: Critical thinking is characterized by the comprehensive analysis of issues, ideas, and evidence before accepting or formulating an opinion or conclusion. Students analyze information carefully and logically from multiple perspectives, using discipline-specific methods, and develop reasoned solutions to problems.

- Apply integration techniques and critical thinking effectively to evaluate integrals of applied problems including areas between curves, volumes of solids, and length of a curve.
- Analyze the series according to its form and apply a list of the tests to determine the convergence of the series.
Apply Calculus to the parametric/polar equations to find the area of the region and length of a curve.

These SLOs are assessed through weekly discussions, homework assignments and quizzes, three semester exams and final exam.

5. ONLINE COURSE EVALUATION

Students are asked to provide feedback on the quality of instruction in this course by completing online evaluations at [https://evaluations.ufl.edu](https://evaluations.ufl.edu). Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open.

This syllabus is subject to change. You will be notified if any changes are made.

Updated 8/18/2017
PREREQUISITES MATERIAL FOR MAC2311, 2312

This course assumes that you have a sound precalculus background. The following is a summary of some important concepts used in solving calculus problems. The textbook provides a more complete review of these essential topics.

ALGEBRA

1. Basic Geometric Formulas: \( b = \text{base}, \ l = \text{length}, \ h = \text{height}, \ w = \text{width} \)

   Triangle: area \( = \frac{1}{2} bh \)

   Circle: area \( = \pi r^2 \); circumference \( = 2\pi r \)

   Parallelogram: area \( = bh \)

   Rectangular box: volume \( = lwh \)

   Sphere: volume \( = \frac{4}{3}\pi r^3 \); surface area \( = 4\pi r^2 \)

   Right circular cylinder: volume \( = \pi r^2 h \); surface area \( = 2\pi rh + 2\pi r^2 \)

   Right circular cone: volume \( = \frac{1}{3}\pi r^2 h \); surface area \( = \pi r\sqrt{r^2 + h^2} \)

   Facts about similar triangles

   Pythagorean theorem: \( x^2 + y^2 = z^2 \)

2. Basic Functions and their graphs

   \( f(x) = x; \ f(x) = x^2; \ f(x) = x^3; \ f(x) = |x|; \ f(x) = \sqrt{x}; \ f(x) = \frac{1}{x} \)

   \( f(x) = b^x, \ b > 0 \) and \( b \neq 1 \), such as \( f(x) = 2^x \)

3. Factoring

   \( x^3 + y^3 = (x + y)(x^2 - xy + y^2); \ x^3 - y^3 = (x - y)(x^2 + xy + y^2); \) etc.
4. Completing the square
\[ x^2 + ax + b = \left( x + \frac{a}{2} \right)^2 + \left( b - \left( \frac{a}{2} \right)^2 \right) \]

5. Law of exponents
\[ x^n y^n = (xy)^n; \quad x^n x^m = x^{n+m}; \]
\[ \frac{x^n}{x^m} = x^{n-m}; \quad (x^n)^m = x^{nm} \]

6. Roots
\[ \sqrt[n]{x} = x^{\frac{1}{n}}; \quad x^{-n} = \frac{1}{x^n}, \text{ etc.} \]

7. Inequalities and absolute values
\[ |x| = a - a \leq x \leq a; \quad |x| > a \quad x > a \text{ or } x < -a \]

8. Properties of logarithms
If \( x > 0 \), \( \log_a x = y \) if and only if \( x = a^y \)
If \( m > 0 \) and \( n > 0 \), then
\[ \log (nm) = \log (n) + \log (m) \]
\[ \log \left( \frac{n}{m} \right) = \log (n) - \log (m) \]
\[ \log (n^c) = c \log (n) \]
\[ \log_b (x) = \frac{\ln(x)}{\ln(b)} \]

TRIGONOMETRY

1. Identities:
\[ \sin(-\theta) = -\sin \theta \]
\[ \cos(-\theta) = \cos \theta \]
\[ \tan(-\theta) = -\tan \theta \]
\[ \sin \left( \frac{\pi}{2} - \theta \right) = \cos \theta \]
\[ \cos \left( \frac{\pi}{2} - \theta \right) = \sin \theta \]
\[ \tan \left( \frac{\pi}{2} - \theta \right) = \cot \theta \]
\[ \sin^2 \theta + \cos^2 \theta = 1 \]
\[ \sec^2 \theta = 1 + \tan^2 \theta \]
\[ \csc^2 \theta = 1 + \cot^2 \theta \]

2. Sum and Difference Formulas:
\[ \sin(A \pm B) = \sin A \cos B \pm \cos A \sin B \]
\[ \cos(A \pm B) = \cos A \cos B \mp \sin A \sin B \]
\[ \tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \]

3. Double Angle Formulas:
\[ \sin 2\theta = 2 \sin \theta \cos \theta \]
\[ \cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta \]

4. Half-Angle Formulas:
\[
\sin^2 \theta = \frac{1 - \cos 2\theta}{2} \quad \cos^2 \theta = \frac{1 + \cos 2\theta}{2}
\]

5. Trigonometric Values:

<table>
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<th>( \theta )</th>
<th>0</th>
<th>( \pi/6 )</th>
<th>( \pi/4 )</th>
<th>( \pi/3 )</th>
<th>( \pi/2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \sin \theta )</td>
<td>0</td>
<td>( 1/2 )</td>
<td>( \sqrt{3}/2 )</td>
<td>( \sqrt{3}/2 )</td>
<td>1</td>
</tr>
<tr>
<td>( \cos \theta )</td>
<td>1</td>
<td>( \sqrt{3}/2 )</td>
<td>( \sqrt{2}/2 )</td>
<td>1/2</td>
<td>0</td>
</tr>
<tr>
<td>( \tan \theta )</td>
<td>0</td>
<td>( \sqrt{3}/3 )</td>
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<td>( \sqrt{3} )</td>
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</table>

**PREREQUISITES MATERIAL FOR MAC2312**

This course assumes that you have a sound calculus 1 background. The following is a summary of some important concepts and formulas used in solving calculus problems. The textbook provides a more complete review of these essential topics.

**FORMULAS YOU ARE EXPECTED TO KNOW**

1. **COMPLETING THE SQUARE:**
   \[
   x^2 + ax + b = \left(x + \frac{a}{2}\right)^2 + \left(b - \left(\frac{a}{2}\right)^2\right)
   \]

2. **PARABOLA:**
   \[
   y = f(x) = ax^2 + bx + c, \text{ vertex } (h, k), \text{ where } h = -\frac{b}{2a} \text{ and } k = f\left(-\frac{b}{2a}\right)
   \]

3. **CIRCLES:**
   \[
   (x - a)^2 + (y - b)^2 = r^2, \quad \text{Center at } (a, b), \text{ radius } r
   \]

4. **DERIVATIVES OF AN INVERSE FUNCTION:**
   
   If \( g = f^{-1} \), then \( g'(x) = \frac{1}{f'(g(x))} \)

5. **DIFFERENTIATION/INTEGRATION FORMULAS:**
   
   **CHAIN RULE** \( (f(g(x)))' = f'(g(x))g'(x) \)
   
   **PRODUCT RULE** \( (f(x)g(x))' = f(x)g'(x) + g(x)f'(x) \)
   
   **QUOTIENT RULE** \( \left(\frac{f(x)}{g(x)}\right)' = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2} \)
   
   \[
   \frac{d}{dx}(x^n) = nx^{n-1} \quad \int x^n \ dx = \frac{x^{n+1}}{n+1} + C
   \]
\[
\begin{align*}
\frac{d}{dx}(\ln x) &= \frac{1}{x} & \frac{1}{x} \, dx &= \ln |x| + C \\
\frac{d}{dx}(e^x) &= e^x & \int e^x \, dx &= e^x + C \\
\frac{d}{dx}(a^x) &= (\ln a)a^x & \int a^x \, dx &= \frac{a^x}{\ln a} + C \\
\frac{d}{dx}(\sin x) &= \cos x & \int \cos x \, dx &= \sin x + C \\
\frac{d}{dx}(\cos x) &= -\sin x & \int \sin x \, dx &= -\cos x + C \\
\frac{d}{dx}(\tan x) &= \sec^2 x & \int \sec^2 x \, dx &= \tan x + C \\
\frac{d}{dx}(\cot x) &= -\csc^2 x & \int \csc^2 x \, dx &= -\cot x + C \\
\frac{d}{dx}(\sec x) &= \tan x \sec x & \int \tan x \sec x \, dx &= \sec x + C \\
\frac{d}{dx}(\csc x) &= -\cot x \csc x & \int \cot x \csc x \, dx &= -\csc x + C \\
\frac{d}{dx}(\arcsin x) &= \frac{1}{\sqrt{1-x^2}} & \int \frac{1}{\sqrt{1-x^2}} \, dx &= \arcsin x + C \\
\frac{d}{dx}(\arctan x) &= \frac{1}{1+x^2} & \int \frac{1}{1+x^2} \, dx &= \arctan x + C \\
\frac{d}{dx}[f(g(x))] &= f'(g(x))g'(x) & \int f'(g(x))g'(x) \, dx &= \int f(u) \, du \\
\int \tan x \, dx &= \ln |\sec x| + C \quad \text{or} \quad -\ln |\cos x| + c
\end{align*}
\]