MAC 2311: CALCULUS I ONLINE SPRING 2021

SYLLABUS/CALENDAR

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Course homepage is located on Canvas, http://elearning.ufl.edu

IMPORTANT: While taking this class online,

- **You MUST take the exams with Honorlock on the dates shown on the course calendar.**
- **You MUST have steady internet access, reliable computer with webcam.**
- **You may receive a score of ZERO on the test if your internet connection drops or your computer/webcam malfunction during the test, for which a make-up exam may not be offered**.
- **There is a live version of MAC 2311. While we cover the same material, the course policies are different.**

MAC 2311 – Calculus 1 Course Policies and Syllabus

MAC 2311: Calendar, Spring 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
	Jan 11 Lecture 1	12 Lecture 2	13 Lecture 3	14 Lecture 4 LQ1	15 Drop/Add Deadline LQ2-3
17 LQ4	18 MLK Day	19 Lecture 5 Quiz 1 (L1-3)	20 Lecture 6 Syllabus Quiz	21 Xronos Tutorial	22 Lecture 7 Makeup exam signup deadline LQ 5 / HW 1
24 LQ 6 / HW 2	25 Lecture 8	26 Quiz 2 (L4-5)	27	28	29 LQ 7 / HW 3 LQ 8 / HW 4
31 E1 Review sheet	Feb 1 E1 Review Quiz	2 Quiz3(L6-8) DIS 1	3 EXAM 1 (L1-8)	4 Lecture 9	5 Lecture 10
7 LQ 9 / HW 5	8 Lecture 11	9	10 Lecture 12	11	12 LQ 10 / HW 6 LQ 11 / HW 7 Lecture 13
14 LQ 12 /HW 8	15 Lecture 14	16 Quiz 4 (L9-11)	17 Lecture 15	18	19 LQ 13 /HW 13 LQ 14 /HW 9 Lecture 16
21 LQ 15 /HW 10	22 Lecture 17	23 Quiz 5 (L12-14)	24	25	26 LQ 16 /HW 12 LQ 17 / HW 11
28 E2 Review sheet	Mar 1 E2 Review Quiz	2 Quiz 6 (L15-17) DIS 2	3 EXAM2 (L9-17)	4 Lecture 18	5 Lecture 19
7 LQ18 /HW 14	8 Lecture 20	9	10 Lecture 21	11	12 LQ19 / HW15 LQ20 / HW16 Lecture 22
14 LQ21 / HW17	15 Lecture 23	16 Quiz 7 (L18-20)	17 Lecture 24	18	19 LQ22 / HW18 LQ23 / HW19 Lecture 25
21 LQ24 / HW20	22 Lecture 26	23 Quiz 8 (L20-22)	24	25 Lecture 27 Quiz 9 (L23-24)	26 LQ25 / HW21 LQ26
28 LQ27 / HW22	29 E3 Review Sheet	30 Quiz 10 (L25-27)	31 E3 Review Quiz DIS 3	Apr 1 EXAM 3 (L18-27)	2 Lecture 28
4	5 Lecture 29	6 LQ28 / HW23	7 Lecture 30	8	9 LQ29 / HW24 Lecture 31 Withdraw Deadline
11 LQ30 / HW25	12 Lecture 32	13 Quiz 11 (L28-29)	14	15	16 LQ31 / HW26 LQ32 / HW27
18 FE Review Sheet	19 FE Review Quiz	20 Quiz 12 (L30-32) DIS 4	21 Verify grades	22 Reading Day	23 Reading Day

Final Exam (L1-32): April 26 (Monday)

*All **Exams** and **Quizzes**: are proctored by Honorlock. Exams are open from 1AM-10:00PM (EDT/EST) on the dates shown in the calendar. Each Quiz is open for 2 days, from 1:00AM(EDT/EST) the day before till 10PM the due date.
*All **LQ** and **HW**: are due on the date shown here at 11:59PM, also allowing 1 day late with 20% grade penalty. Online Submission: Submit your work with ample time before the final hours to avoid last minute submission issues. Students are responsible for making sure their submission is completed successfully before it's due.
***Discussions posts** (exam material for extra credits): closes at 11:59PM (EDT/EST)

2. INTRODUCTION

2a. COURSE CONTENT: MAC 2311 is the first in the three-semester sequence MAC 2311, MAC 2312, MAC 2313 covering the basic calculus. Intended topics will include limits, differentiation, applications of the derivative and introduction of integration.

A minimum grade of C (note C -) in MAC 2311 satisfies four credits of general education requirement and also satisfies the pure math portion of the state Writing/Math requirement.

This is an ONLINE VERSION of MAC 2311 – all content is delivered online. Students view 32 online lectures, complete lecture questions(lecture quizzes, LQ), homework, and quizzes in the course management system Canvas. Students are encouraged to post questions and answers on the Discussions Board you can access through Canvas. Three semester exams and a final are also posted in Canvas and administered through Honolock.

2b. PREREQUISITES: MAC 2311 assumes that you have essential precalculus skills (both algebra and trigonometry) necessary to succeed in calculus. Students should be able to do arithmetic without a calculator.

To enroll in MAC 2311, you must have earned a grade of C or better in MAC 1147 (or its equivalent, both MAC 1140 and MAC 1114), earned calculus credit through an exam or earlier coursework, or have taken the ALEKS placement assessment and attained the required minimum score. (You may take the ALEKS assessment through the Students Self Service homepage, click on Placement under My Online Services. For more complete information, check the page student.ufl.edu/aleksinfo.html.) Note that following paragraph: “The Department of Mathematics encourages you to take the assessment even if you have met one of the prerequisites for MAC 2311. Quite often, your algebra and trigonometry skills may need review and your placement assessment can provide information and specific areas for additional study. “ You can check with an advisor in your college to be sure that you are eligible for MAC 2311.

MAC 2311 begins with a short review of precalculus. You should already be competent in working this material. We strongly recommend that students who are having difficulty with the precalculus review material consider first taking MAC 1147, a four credit precalculus course reviewing essential calculus skills. You may switch courses on ONE.UF during the drop-add period.

2c. REQUIRED MATERIALS:

Textbook: Calculus: Openstax Calculus Volume 1 . (free online copy)

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. In particular it has been noted that Safari has some issues with Canvas, so it is recommended that you do not use Safari when accessing assignments on canvas.

Calculators: No Calculators are allowed on exams. However, A graphics calculator, WolframAlpha and Desmos are useful as a study and learning tool when used appropriately, but

they are not essential. **Remember that Calculus is a collection of ideas that are not mastered through calculator skills**.

2d. COURSE CALENDAR: Check the course calendar for due dates and plan your schedule accordingly. It's possible to get ahead in this class by completing assignments early. Adjust your schedule to complete the assignments earlier rather than later if you have other commitments. Test dates, however, will not be changed.

2e. E-LEARNING IN CANVAS: UF Online 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 Discussions forum for communication.

All grades are posted in Canvas. 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 issues/disputes after one week, and especially not 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, you may utilize the Discussions Board and office hours. Use the Discussions Board to post questions and to supply answers to your fellow classmates. Your instructor will check the discussions regularly.

2f. 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 Questions before attempting homework. You may post questions on the course discussion board if you need clarification of a topic. The Broward Teaching Center at UF provides free online support and is a valuable resource.

Lecture notes outlines: You may purchase the lecture note packet from Target copy on 1412 W. University Ave. or download and print them out from each module page. Please see Canvas homepage for more details. It is important that you should have a hard copy of the lecture notes in order to follow along the lecture easier when watching the videos.

2g. SUCCESS: Other than having a strong precalculus background, success in MAC 2311 depends largely on your attitude and effort. It is not effective to watch a video and copy notes without following the thought process involved in the lecture. For example, you should try to answer the questions posed by your lecturer. Students who do not actively participate have much more difficulty. For that reason there are Lecture Questions included in each lecture which you will answer in Canvas as part of your final grade.

However, be aware that much of the learning of mathematics at the university takes place outside of the classroom. You need to spend time reviewing the concepts of each lecture from the videos and textbook **before** you attempt homework problems. It is also important to look over the textbook sections to be covered in the next lecture to become familiar with the vocabulary and main ideas before watching the videos. That way, you will better be 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 course. This is a 4 credit hours class, **you should therefore plan to spend a minimum of 12 hours each week on this online course in addition to the time spent watching the lecture videos. If you are having difficulty with the material, expect to spend more time.**

It is critical that you keep pace with the course material as presented in the module for each week. Do not fall behind. **Ask questions either during online office hours or on the Discussions Board;** do not let misunderstandings go unanswered. You should check the Discussions board regularly, posting questions and answers for fellow classmates. 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, without help, by the time of a quiz or exam.

Our hope is that through focused study and practice you will gain a real appreciation for the important concepts of calculus and their application. We want you to succeed in this class! But you must 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, are intellectually engaged in learning the material will get the most from the course.

2h. STUDENTS WITH LEARNING DISABILITIES: Students requesting class and exam accommodations must first register with the Dean of Students Office Disability Resource Center (DRC). The DRC office will provide a documentation letter to the students to present to the course coordinator. This must be done as early as possible in the semester, **at least one week before the first exam**, so there is adequate time to make proper accommodations.

2i. ACADEMIC HONESTY: Remember that you committed yourself to academic honesty when you registered at the University of Florida by agreeing to the Honor Pledge below:

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 Guideline: "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.

You may find the Student Honor Code and read more about student rights and responsibilities concerning academic honesty here.

In addition, we remind you that lecture videos are the property of the University/faculty member and may not be used for any commercial purposes. Students found to be in violation may be subject to discipline under the Students Conduct Code.

3. TESTING

3a. SEMESTER EXAMS: During the semester, three tests will be given on the dates shown on the course calendar. The exam will be given in Canvas and administered through Honorlock. Each exam is a 90 minutes exam. See 4e for more. Once you start the exam, the clock starts ticking, you must complete the exam in one sitting. Each exam will be scored on a scale of 0 to 90 points, but capped at 80 points. There is no retake after you have taken the exam, there is no drop, replacement or average of exam grade.

3b. FINAL EXAM: A mandatory, comprehensive final examination will be given on the date shown in the course calendar. This will be given in exactly the same manner as the 3 semester exams except the final exam is 120 minutes. More details will be given in Announcements.

Missing any exam due to negligence, however, will result in a **minimum** 10-point penalty.

Note: You may not use a calculator or any other study aid for exams. Be sure to read the HonorLock handout thoroughly to understand the exam procedure before you start an exam.

3c. IMPORTANT EXAM POLICIES: MAC 2311 requires that students take exams through Honorlock online on the listed dates. There are no exceptions to this. Students with conflicts, including regularly scheduled classes or traveling, must make advance arrangements to be present at the test. We allow a large window of time (1:00AM – 10:00PM US EST) so that you can arrange a fitting time slot that works for you.

The following applies to all exams:

1. Students are responsible for material covered in lectures, and (reading) assignments. Questions will test mastery of concepts and include challenging calculation problems**. A command of related algebraic and trigonometric concepts is assumed**. (see Prerequisites page in this guide).
2. In order to use Honorlock and take the Exams you will need a reliable computer, webcam, and stable internet access. You will need to be using the Google Chrome browser and download the Honorlock Extension for Chrome (www.honorlock.com/extension/install). You can see the Honorlock Student Guide linked below for information on how to download and use Honorlock.

3. Bring only the following while taking an exam with Honorlock: two picture IDs (UF Gator One Card and your state driver's license) with a **legible signature** and blank scratch paper (up to 10 sheets), few pen/pencil (and sharpener) for your scratch work. Cell phones and other electronic devices must be turned off and out of sight, out of reach. They cannot be on the working area while you are taking an exam. If any such device rings or buzzes, your test will be considered to be compromised.

   Please see the Honorlock Student Guide at Honorlock Student Guide and the Best Practices guide at Honorlock Best Practices.

   See Section 4g for the Exam Make-Up Policies.

4. GRADING

4a. COURSE GRADE: Your course grade is based on 500 points accumulated as follows:

10 Quizzes (best 10 of 12)	80
Xronos HW Assignments	60
Lecture Questions	20
3 Semester Exams	240
Final	100
Total	500

The total sum of points is your numerical score, which will be converted to a letter grade according to the following scale. The course grade is determined by passing the minimum point thresholds listed in the table below. **There will be no additional curve, end-of-semester round ups, or extra assignments for individual students. You MUST meet the thresholds below to receive that letter grade**

A	450 points ~ 90%	C	330 points ~ 66%
A –	435 points ~ 87%	C – *	315 points ~ 63%
B +	420 points ~ 84%	D +	300 points ~ 60%
B	400 points ~ 80%	D	285 points ~ 57%
B –	380 points ~ 76%	D –	270 points ~ 54%
C +	360 points ~ 72%	E	0 points ~ 0%

'***NOTE** A grade of "C –" DOES NOT give math General Education credit!

For those taking the S – U option: S[330 – 500 points] U [0 – 329.99 points]

Approval of the 'S – U' option must be obtained from and approved by the registrar's office. The deadline for filing an application with the Registrar and further information on the 'S – U' option are found in the Undergraduate Catalog. For a complete explanation of current policies for assigning grade points, refer to the UF undergraduate catalog.

4b. VIDEOS and LECTURE QUESTIONS(LQ): Viewing the lecture presentations is an important aspect of the learning process. Videos are accessed through the modules in Canvas. There are 2-3 lecture quiz questions to be completed with each lecture and you have 2 tries per each lecture quiz. You may earn up to 20 points by completing lecture quizzes by the specified due date.

You should work these problems as you watch the lectures and then enter your answers directly in Canvas. We encourage you to use the text as well as the videos to help answer these questions.

4c. XRONOS (HW): The online homework administered on Xronos is planned to review concepts and provide practice of the lecture material. During the course of the semester, online assignments will be assigned on a routine basis and must be completed before the due dates listed in the course calendar. Your total score on online homework assignments will count up to a maximum 60 points, but the total number of points available is higher to offset credit lost due to technical difficulties or a missed assignment.

The homework problems are graded by Xronos and your score is immediately available in Canvas after submitting your work. You will have unlimited attempts for each problem.

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

4d. CANVAS ONLINE QUIZZES: Twelve quizzes will be posted in Canvas to be due on the dates listed in the course calendar. There is a 2-day window to take your quiz, which is closed book, one attempt and proctored by Honorlock. You will have 45 (+15 extra) minutes to complete an online quiz; the clock starts from the time you open your quiz. Each quiz will be graded on a scale of 0 to 8 points and the top ten scores will count, to total up to 80 points. **DO NOT wait until the last minute to submit your quiz.** You will see your quiz score after you have submitted your quiz. The quizzes are not released to students, but you may request a 15 minutes private conference with your TA to review your quiz within one week of your grade is posted.

NOTE: Xronos Homework, quizzes and Lecture Questions account for 160 points of the total to be earned in the course. They are a significant part of your grade, to reflect their importance in understanding course concepts.

4e. EXAMS: Three semester exams (capped at 80 points each) and a cumulative final exam (capped at 100 point) are given online in Canvas. Exams are close-book and timed. You will have 90 (+90 extra) minutes to complete your exam. Like the quiz, your exam grade will be available in Canvas gradebook once it is submitted. The MAC 2311 exams are not released to students, but you may request a 20 minutes private online conference with your TA to review your exam within one week of the exam (within 48 hours of the final exam)

There are already built-in extra time for possible delay involving proctored quizzes/exams, therefore we will NOT extend more time for computer issues or server or any other problems.

4f. EXTRA CREDIT: You may earn additional points in the following ways:

- SYLLABUS QUIZ (3 points): In Canvas you will find the Course Information 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. You have 3 attempts before the due date. You may submit Syllabus quiz 1 day late with 20% grade penalty.
- COURSE PARTICIPATION (8 points): We encourage you to utilize online office hours and the MAC 2311 Discussions Board regularly to ask and answer questions about course material and homework. You can earn up to 2 points per exam period by posting a question and responding to other students' math questions. Answers must be appropriate and relate to course material and follow the specific format instruction to earn credit. See Discussions Board instruction page for more details.
- EXAM PREPARATION (20 points): An exam review sheet is posted in Canvas for each test and students can earn up to 2 bonus points by submitting their work before due date . In addition, a bonus exam review assessment will be available in CANVAS before each test and the assessment will include questions from previous MAC 2311 exams so that you will have a flavor of the type of questions that you will see on the actual test.

4g. MAKE-UP POLICIES AND EXTENSIONS:

- EXTENSIONS ON XRONOS HOMEWORK: There are 65+ points available in Xronos HW but you may only earn up to 60 points, so we *do not offer make-ups*. Plus, while it is a much better strategy to work ahead, occasionally you may fall behind. You may complete your Xronos HW one day late, but a 20% grade penalty will be applied.
- MAKE-UP QUIZZES: We offer 2 drops on quizzes, so we *do not provide make-ups* for online quizzes. To allow time for computer issues, it is recommended not to wait until final hours on the due date to start your quiz, and don't wait till the last minute to submit your work.
- MAKE-UP LECTURE QUESTIONS: There are 23+ points available in lecture questions but you may only earn up to 20 points, so we *do not offer make-ups*. Plus, you may complete your lecture questions one day late with a 20% grade penalty.
- MAKE-UP EXAMS: Students must provide valid documentation for requesting a make-up exam due to a scheduling conflict by the end of the second week to avoid penalty. If illness or other extenuating circumstances force you to miss an exam, contact the instructor or TA as soon as possible (no later than 24 hours after the exam) for approval to schedule a make-up exam. We do not consider traveling, work or lack of internet access as a valid excuse for a make-up exam.
- OTHER MAKE-UPS: There are *no make-ups on any extra credit assignments*.

4h. INCOMPLETE GRADE: 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 instructor before final week for departmental approval and must provide documentation of the extenuating circumstances preventing him or her from taking the final exam, then sign the contract once approved. **The grade of "I" is never used to avoid an**

undesirable grade, and does not allow a student to redo work already taken or to retake the course. See the official policy here.

5. GENERAL EDUCATION INFORMATION

MAC 2311 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 effective 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 online office hours.

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.

1. **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.

    - Understand the fundamental concept of limit.
    - Understand the definition of the derivative and be competent at calculating derivatives using the product, quotient, and chain rules.
    - Understand the definition of the definite integral via Riemann sums and gain competence in evaluating them directly from the definition.

2. **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.

3. **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 techniques of derivatives and critical thinking effectively to solve applied problems including related rates and optimization problems.
- Analyze properties of functions using derivatives including regions of increase/decrease inflection points, local maxima/minima.
- Apply the Fundamental Theorem of Calculus to the evaluation of definite integrals and understand the link between differentiation and integration.

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

6. ONLINE COURSE EVALUATION

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available here. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive. Summaries of course evaluation results are available to students here.

7. DIVERSITY AND INCLUSION

The Mathematics Department is committed to diversity and inclusion of all students. We acknowledge, respect, and value the diverse nature, background and perspective of students and believe that it furthers academic achievements. It is our intent to present materials and activities that are respectful of diversity: race, color, creed, gender, gender identity, sexual orientation, age, religious status, national origin, ethnicity, disability, socioeconomic status, and any other distinguishing qualities.

This syllabus is subject to change. You will be notified if any changes are made through Announcements and/or emails.

REREQUISITES FOR MAC 2311

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

ALGEBRA

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

   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: $volume = \pi r^2 h;\ \ Sureface\ area = 2\pi rh + 2\pi r^2$

   Right circular cone: $volume = \frac{1}{3}\pi r^2 h$

   Facts about similar triangles

   Pythagorean theorem: $x^2 + y^2 = z^2$ where z is the hypotenuse of the right-angled triangle

2. Basic Functions and their graphs: $f(x) = x,\ f(x) = x^2,\ f(x) = x^3,\ f(x) = \frac{1}{x}\ ,\ f(x) = \sqrt{x},$
   $f(x) = b^x,\ b > 0,\ b \neq 1;\qquad f(x) = |x|$

3. Factoring: $x^2 - y^2 = (x - y)(x + y);\ \ x^3 \pm y^3 = (x \pm y)(x^2 \mp xy + y^2)$; etc.

4. Fractions: $\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd},\ \ etc.$

5. Exponents: $x^n y^n = (xy^n);\ \ x^n x^m = x^{n+m};\qquad (x^n)^m = x^{mn};\ \ \frac{x^n}{x^m} = x^{n-m}$

6. Roots, including rationalizing the denominator or numerator. $\sqrt[n]{x} = x^{\frac{1}{n}};\ \ x^{-n} = \frac{1}{x^n}$, etc.

7. Inequalities and absolute values: $|x| \leq a \rightarrow -a \leq x \leq a;\quad |x| > a \ \rightarrow\ \ x > a\ \ or\ x < -a$

8. Equation solving: Finding solutions for x if: $ax + b = 0;\quad ax^2 + bx + c = 0;\ \ etc.$

9. Logarithms: If $x > 0$, $\log_a x = y$ if and only if $a^y = x,\ \ a > 0,\ a \neq 1$

   If $m > 0$ and $n > 0,$ then $\log(mn) = \log m + \log n\,;\ \ \log\left(\frac{n}{m}\right) = \log n - \log m\,;\ \ \log(n^c) = c\log n$

TRIGONOMETRY

1. Identities: $\sin(-\theta) = -\sin\theta,\qquad \cos(-\theta) = \cos\theta,\qquad \tan(-\theta) = -\tan\theta$

   $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta,\qquad \cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta\,,\qquad \tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta$

   $sin^2\theta + cos^2\theta = 1,\qquad sec^2\theta = 1 + tan^2\theta,\qquad csc^2\theta = 1 + cot^2\theta$

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

3. Double Angle Formulas: $\sin(2\theta) = 2\sin\theta\cos\theta$; $\cos(2\theta) = cos^2\theta - sin^2\theta = 2cos^2\theta - 1 = 1 - 2sin^2\theta$

4. Half-Angle Formulas: $sin^2\theta = \frac{1-\cos(2\theta)}{2}$, $cos^2\theta = \frac{1+\cos(2\theta)}{2}$

5. Trigonometric Values:

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$ or $\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undef