

MAC 2233: Survey of Calculus
Online Version
Fall 2018
Syllabus, Calendar, Grading

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MAC 2233
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MAC2233 Online Calendar Fall 2018

	Monday	Tuesday	Wednesday	Thursday	Friday
Introduction Module 1	8/20	21	22 Pre-calculus review, sec. R1-7	23	24 Lecture 1
Module 2	27 Lecture 2	28 Precalculus Review Assignment* Add/Drop Ends	29 Lecture 3	30 Precalculus Review Quiz* Syllabus Quiz*	31 Lecture Quizzes 1-3* Homework 1-3* Lecture 4
Module 3	9/3 Labor Day	4	5 Lecture 5	6 Quiz 1, L1-3*	7 Lecture 6
Module 4	10 Lecture 7	11	12 Lecture 8	13 Quiz 2, L4-6*	14 Lecture 9
Module 5, 6	17 Lecture 10	18	19 Lecture 11	20 Quiz 3, L7-9*	21 Lecture 12
Exam 1 Module 6	24 Exam Review	25	26 Exam Review	27 Exam 1**	28 Lecture 13
Module 7	10/1 Lecture 14	2	3 Lecture 15	4 Quiz 4, L10-11* Quiz 5, L12-13*	5 Lecture 16
Module 8	8 Lecture 17	9	10 Lecture 18	11 Quiz 6, L14-16*	12 Lecture 19
Modules 9	15 Lecture 20	16	17 Lecture 21	18 Quiz 7, L17-19*	19 Lecture 22
Module 10	22 Lecture 23	23	24 Lecture 24	25 Quiz 8, L20-22*	26 Lecture 25
Exam 2 Module 11	29 Lecture 26	30	31 Exam Review	11/1 Exam 2**	2 Homecoming
Module 11, 12	5 Lecture 27	6	7 Lecture 28	8 Quiz 9, L23-25* Quiz 10, L26-27*	9 Lecture 29
Module 12, 13	12 Veteran's Day	13	14 Lecture 30	15 Quiz 11, L28-30*	16 Lecture 31
Review Module 13	19 Exam Review Lecture 32 Drop Deadline for W	20	21 Thanksgiving Break	22 Thanksgiving Break	23 Thanksgiving Break
Exam 3 Module 13, 14	26 Exam Review	27 Exam 3**	28 Lecture 33	29 Quiz 12, L31-32*	30 Lecture 34
Module 14	12/3 Lecture 35	4	5 Lecture Quiz 35* Homework 35*	6 Quiz 13, L33-35*	7 Last day to earn credit for MML HW
Final Exam: Tuesday, December 11, 5pm-10pm (schedule a two-hour time block with ProctorU)					

* All dates listed are the final due dates for the quiz, review or homework. Work must be complete by 11:59PM.

**Exams in CANVAS must be scheduled with Proctor U at least 3 days in advance. Available from 6PM – 11:59 PM, in a 90-minute time slot: Exam 1, 9/27; Exam 2, 11/1; Exam 3, 11/27; Final Exam 12/11

After week 2, the homework in MyMathLab and lecture quizzes in CANVAS for each lecture are due the date of the next lecture.

MyMathLab Quizzes: You must earn 75% on a MML assignment before you can take the quiz on that material. You can still work on the assignments until December 7.

2. INTRODUCTION

2a. COURSE DESCRIPTION and CONTENT. MAC 2233 is the first in the two semester sequence MAC 2233 and MAC 2234 surveying the important ideas of calculus but emphasizing its applications to business, economics, life and social sciences. The course covers important precalculus topics: basics of functions and graphing, specific functions and their applications as models (linear, quadratic, rational, exponential and logarithmic) as well as calculus: limits, the definition of the derivative, differentiation techniques, applications of the derivative including rates of change, curve sketching, and optimization, introduction to integration and its applications including area and total change.

A minimum grade of C (**not** C⁻) in MAC 2233 satisfies three credits of the university General Education quantitative requirement, and three hours of the state Writing/Math requirement.

This is an ONLINE VERSION of MAC 2233 – all content is delivered online. Students view 35 online lectures in the course management system CANVAS, and complete online homework and quizzes using MyMathLab software. Students are encouraged to post questions and answers on the course discussion board in CANVAS. Three semester exams and a final are posted in CANVAS and administered through ProctorU.

2b. PREREQUISITES. MAC 2233 assumes that you have essential precalculus skills necessary to succeed in calculus. This course does not cover trigonometry.

To enroll in MAC 2233, you must have earned a grade of C or better in MAC 1140, precalculus algebra, 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 ONE.UF homepage <https://one.uf.edu>; click on Placement under My Online Services. For more complete information, check the page <https://student.ufl.edu/aleksinfo.html> Note the following paragraph: “The Department of Mathematics encourages you to take the assessment even if you have met one of the prerequisites for MAC 2233. You may need to review your algebra skills and your placement assessment can provide information and specific areas for additional study.” You can check with an advisor in your college or contact your instructor if you have questions about placement.

MAC 2233 begins with a short review of precalculus topics and a precalculus review assignment and quiz in MyMathLab. Completing these assignments during the first week of the semester will help you assess your preparation for calculus. **You should already be competent in working this material. We strongly recommend** that students who are having difficulty with the review assignments consider first taking MAC 1140, a three credit review of Precalculus Algebra which is offered as a UF online course. You may switch courses through ONE.UF during the drop-add period.

In an agreement with the registrar’s office, you have one additional week to drop back to MAC 1140. **After the drop-add period, the paperwork to move back to precalculus MAC 1140 must be completed through the math department. The deadline is Wednesday, September 5th at 4PM.** Contact an advisor in your college for more details.

2c. REQUIRED MATERIALS.

Textbook: **Calculus with Applications, Tenth Edition** by Lial, Greenwall and Richey. The text may be accessed as an ebook through the online MyMathLab homework system. **You have a two week grace period to use MyMathLab for free.** After that period, you must have an access code to use MyMathLab. You may purchase the code online through MyMathLab, or at the UF bookstore. You access MyMathLab directly in CANVAS, as a tool on the left sidebar of any course page. More registration information is provided in CANVAS.

It is not required, but some students prefer a hard copy of the text. You may purchase this from the UF bookstore or find used copies online.

DO NOT TRY to purchase your access code online except from Pearson through MyMathLab. Other codes may not provide access to our MyMathLab course set up in CANVAS.

If you are having problems accessing MyMathLab through CANVAS or if your access code is showing as invalid, please contact the publisher at: allaccess@bsd.ufl.edu.

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 MyMathLab. Be sure you are using a browser that works with MyMathLab and CANVAS; **do not use Safari since some course material may not show up correctly.** Your MyMathLab homepage provides a browser check.

You may contact the publisher using the following link if you are having difficulties:

<https://support.pearson.com/getsupport/s/contactsupport>

It is recommended that proctored exams should be taken with a wired connection, rather than wireless, if possible. **You are responsible for having reliable access when working exams or quizzes online.**

Calculators: For text and homework problems, a scientific calculator doing basic statistics is required. A graphing calculator or computer program such as Wolfram Alpha can be useful learning tools when used appropriately to supplement your work on individual problems but they are not required. Some videos will illustrate concepts using a TI-84 graphing calculator.

Remember that calculus is a collection of concepts and ideas that are not mastered through calculator skills. No calculators are permitted on exams. They are designed to be worked without access to a calculator.

2d. COURSE CALENDAR. Check the course calendar (found on page 2 of this document) and CANVAS for due dates and plan your schedule accordingly.

2e. CANVAS, UF's course management system, is accessed through elearning.ufl.edu. Use your Gatorlink username and password to log in. Course information including the MAC 2233 homepage, syllabus, homework assignments, and lecture noteshells are posted on this site. In addition, there is a mail tool and discussion forum for communication.

Grades are posted in CANVAS (MyMathLab scores can be accessed in your MyMathLab gradebook; only total points may be posted in CANVAS). You are responsible to verify that those grades are accurate. **You have one week after a score has been posted either in CANVAS or MyMathLab to resolve any grade concerns by contacting the course coordinator Dr. Harrington. We will not consider these grading 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 and announcements. 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 instructors will check the discussion forum regularly to answer your questions and to provide updates and reminders.

2f. LECTURE VIDEOS. The lecture 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 over the week following the schedule posted on the course calendar. There are questions included in the lectures for practice. After watching the video, you will complete the corresponding Lecture Quiz for each lecture in CANVAS, which count as ten percent of your final grade. **You should study the videos and the corresponding textbook sections to understand the concepts and problem solving algorithms of a lecture before you take the required Lecture Quiz and attempt homework.** You may contact your instructor or post questions on the course discussion board if you need clarification of a topic. Be sure to take advantage of campus and online office hours! The Broward Teaching Center at UF also provides live and online support and is a valuable resource.

Students should print out the lecture noteshells from the module page before watching the video. This will make it easier to take notes and to follow the lecture.

2g. SUCCESS. Other than having a strong precalculus background, success in MAC 2233 depends largely on your attitude and effort. **Mathematics is not a spectator sport. You will only understand the material when you are actively engaged.** It is not effective to watch a video and copy notes without following the thought processes involved in the lecture. Instead, **before watching a lecture video** it is important to look over the textbook sections to be covered to become familiar with the vocabulary and main ideas. That way you will better be able to grasp the lecture material. After watching the video, **before** you attempt homework problems and quizzes, you should reread the text as well as study the lecture to understand its main ideas and the steps involved in solving the example problems.

As with most college courses, you should expect to spend a **minimum** of 2 hours working on your own for every hour of classroom instruction (at least 6 hours per week). **You should therefore plan to spend at least 10-12 hours each week on this online course including the time spent watching the lecture videos.**

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 in office hours (on campus or online) or using the resources listed below; do not let misunderstandings go unanswered. Students who do not actively participate have much more difficulty.

We recommend studying with others, and an important resource to facilitate communication in an online course is the MAC 2233 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. The instructors for MAC 2233 will check the discussion board regularly to answer student questions and to post selected problem solutions.

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.

USE THE RESOURCES AVAILABLE AS YOU STUDY! We encourage you to seek help from your instructors through email and office hours and from your peers using the discussion board in CANVAS. Contact the Broward Teaching Center, teachingcenter.ufl.edu, for tutoring services and sample exams with solutions. MyMathLab also offers videos and other teaching aids, including a solutions manual for the odd numbered textbook exercises.

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 who are intellectually engaged as they work through the lectures and homework will learn 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), dso.ufl.edu/drc/. That office will provide a documentation letter to the student to present to the course instructor. 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 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.

You may find the Student Honor Code and read more about student rights and responsibilities concerning academic honesty at the link dso.ufl.edu/sccr/.

The following from the UF undergraduate catalog provides more information:
[student responsibilities and conduct](#)

In addition, we remind you that lecture videos are the property of the University/faculty member 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.

The next pages describe grading procedures and specific course requirements for MAC 2233.

3. GRADING AND COURSE REQUIREMENTS

3a. COURSE GRADE. Your course grade is based on 500 points accumulated as follows:

MyMathLab assignments	66
MyMathLab quizzes (best 11 of 13, 4 points each)	44
Lecture Quizzes (35 quizzes, 1.5 points each, capped at 50)	50
3 Semester Exams (80 points each)	240
Final exam	<u>100</u>
	500

In addition, extra credit may be earned from the following: Precalculus Review Assignment and Quiz, Syllabus Quiz, and Class Participation including discussion board posts.

Your course grade will be determined according to the following scale. There will be no additional curve in this course, and extra assignments for individual students to improve a grade are NOT possible.

A	450 - 500 pts.	90% - 100%	C	335 - 364 pts.	67% - 72.8%
A-	435 - 449 pts.	87% - 89.8%	C-*	320 - 334 pts.	64% - 66.8%
B+	420 - 434 pts.	84% - 86.8%	D+	310 - 319 pts.	62% - 63.8%
B	400 - 419 pts.	80% - 83.8%	D	285 - 309 pts.	57% - 61.8%
B-	380 - 399 pts.	76% - 79.8%	D-	280 - 284 pts.	56% - 56.8%
C+	365 - 379 pts.	73% - 75.8%	E	less than 280 pts.	or below 56%

***NOTE** A grade of C- DOES NOT give Gordon Rule or General Education credit!

For those taking the S-U option: S [335 – 500 pts.] U [0 to 334 pts.]

Approval of the S - U option must be obtained from your instructor and approved by the registrar's office. The deadline for filing an application with the Registrar and further information about the S-U option are found in the Undergraduate UF Catalog.

A complete explanation of current grade policies, including withdrawals, is found in the catalogue: catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

3b. INCOMPLETE GRADES. 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, or grade of "I". You may complete the course within the first six weeks of the following semester. **An "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 math.ufl.edu/departments/incomplete-grades/

Students must contact the course coordinator with documentation of extenuating circumstances before finals week for departmental approval.

Missing a final exam due to negligence will result in a **minimum** 10 percent penalty.

The components of your course grade are detailed as follows:

3c. GETTING STARTED, SYLLABUS QUIZ. In CANVAS you will find the Start Here page. Watch the introductory videos and then read the syllabus. After you feel comfortable with the course policies listed, take the syllabus quiz posted in CANVAS for extra credit.

3d. MODULES. MAC 2233 is organized into fourteen modules. In CANVAS, each module has an introductory page including the concepts to be covered, and the due dates for the module. From there you may link to the lecture videos, a copy of the notes for each lecture, the Lecture Check Quizzes, and any supplementary material. The three semester exams cover the modules as indicated in CANVAS and on the course calendar.

3e. VIDEOS and LECTURE QUIZZES. Videos are accessed through the modules in CANVAS, and you should print out the lecture outline before each lecture to fill in as you follow the video presentation. There are practice questions included in the lectures; work these problems as you watch the videos. A Lecture Quiz including some of those questions is posted for each lecture in CANVAS. We encourage you to use the text as well as the videos to help you work the quiz problems; one question on a quiz may be from a worked out textbook example so you can see its solution. You may also post questions about the Lecture Quizzes on the class discussion board or ask for help during office hours. These quiz scores will count as 50 points (10%) of your final course grade. **Lecture Quizzes are due the day of the next lecture.** We encourage you to work the quizzes early, after you have watched and studied the videos, while the material is fresh in your mind.

3f. MYMATHLAB HOMEWORK. Online homework administered in MyMathLab is designed to review concepts and to provide practice for lecture material. A total of 35 two point homework assignments will be posted, one for each lecture. Your highest 33 scores will be added and the total will count for 66 points of your final grade. That is, you can drop two assignments.

The homework problems are graded by the software and you see your score immediately after submitting your work. You will have six attempts for each problem (except multiple choice or true/false); there are aids and a link to the ebook to help solve the problems. You may also post on the course discussion boards to get feedback from your peers and instructors. In addition, you may ask for help during live or online office hours.

There are no makeups or drops for online homework. Start early instead of waiting until the due date to avoid missing the deadline. However, once the due date has passed you may still work on the MyMathLab homework assignments through the end of the semester to raise your homework grade. The homework assignments will remain open until December 7 at 11:59PM. There will be a 5% penalty on those questions not completed by the original due date.

3g. MYMATHLAB QUIZZES. Thirteen four point quizzes will be posted in MyMathLab to be due on the dates listed in CANVAS and the course calendar. **You must score a minimum of 75% on the corresponding MyMathLab homework assignments before you can take the quiz. If you are unable to take a quiz, your grade will be zero.** Quizzes are open for 72 hours (3 days) and are due by 11:59PM on the due dates (Thursdays). For quizzes that are due on the same day, the quizzes are open for 144 hours (6 days). You will have three attempts for each quiz and 90 minutes per attempt; the clock starts from the time you open your quiz. **Your top eleven quiz scores will count for a total of 44 points of your final grade. DO NOT wait until the last minute to submit your quiz; we will not extend time for computer issues or MyMathLab server problems.**

Like an in class quiz, you will not know if your answers are correct when you take a quiz. The extra attempts are to give you a chance to review the material and try for a higher score, but you will not see correct answers until the due date has passed. After the due date, you may review your quiz and see the questions missed; look at the quiz or assignment in the MyMathLab gradebook.

3h. Makeup Homework and Quizzes. With the extended availability of online homework, and the 72-144 hour window to take an online quiz along with drops, we do not provide makeups for online work. You must start your assignments and quizzes in plenty of time to allow for computer issues.

Exception: if you must miss class for an extended time due to illness or a family emergency, contact the course instructor to discuss an extension of the due dates in MyMathLab. You must provide documentation that you cannot work on the course assignments.

If you are experiencing a technical problem with MyMathLab, please contact Pearson's MyMathLab Technical Support Team by calling 1-800-677-6337.

NOTE: MyMathLab Homework and quizzes and the Lecture Check Quizzes in CANVAS account for 31% of your total score, to reflect their importance in understanding course concepts.

3i. EXTRA CREDIT. You may earn additional credit in the following ways:

I. SYLLABUS QUIZ, Precalculus Review Assignment and Quiz. These are designed to introduce you to the format of the course, and to provide a review of precalculus skills. These are due the second week of the semester. See course calendar for deadlines.

II. COURSE PARTICIPATION and EXAM PREPARATION. We encourage you to use the MAC 2233 Discussion Board regularly to ask and answer questions about course material and homework. You can earn extra credit by posting questions and responding to other students' posts. Questions must be appropriate and relate to course material to earn credit.

While we encourage participation in the Discussion Board at any time, we find it especially useful in preparing for exams. An Exam Review and sample exam will be posted in CANVAS

for each of the exams. These will give you a flavor of the type of questions you will see on the actual test. You may earn extra credit by responding to other students' work on the Discussion Board and by submitting worked out solutions to review sheet problems.

3j. ADDITIONAL PRACTICE PROBLEMS. Textbook exercises for each lecture are listed in the **Lecture Topics, Reading Topics and Homework** outline posted in CANVAS. These complement the online problems and provide additional practice. There is a solutions manual in MyMathLab with worked out answers to selected exercises. There are also problems called "Now You Try It" listed at the end of the noteshell for some lectures. These were written by the course instructors and are designed to emphasize the important concepts of the lecture and their application. Some are included in the Lecture Quizzes. These problems are not graded, but it is strongly encouraged that you work as many as possible. Answers are posted in CANVAS.

4. TESTING

4a. SEMESTER EXAMS. During the semester, three tests will be given between on the dates shown on the course calendar. The exams will be posted in CANVAS and administered through ProctorU. You will take the exam in a 100 minute time slot between 5PM and 11:59PM. **You must register with ProctorU at <http://go.proctoru.com> for each exam at least 4 days in advance.** See instructions on our homepage in CANVAS. Each exam will count for 80 points of your course grade.

4b. FINAL EXAM. A mandatory, comprehensive final examination will be given as indicated on the course calendar. You will need to register with ProctorU at least four days in advance to schedule a 2 hour time block between 5 and 10PM.

IMPORTANT: The final exam is critical to your course grade and is required of all students. The exam score will count as 100 points of your final point total.

We also allow the final exam score to improve your grade on one of the semester exams. That is, if your final exam score prorated to 80 points is higher than the lowest of your three semester exam scores, it will replace the lowest test score. For example, if you earn 80% (80 points) on the final, the prorated score is 64 (80% of 80 points). If your lowest semester exam is 56 points, that score is replaced by 64 in the gradebook. If the prorated final exam score is lower than your three exams, then it will be disregarded and those three exam scores will be used in your final point total.

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. You are responsible for having a secure connection during the exam. We cannot give makeup work for a failed internet connection.

4c. MAKEUP POLICIES. All makeup work must be approved by the course instructor with documentation provided. **If illness or other extenuating circumstances cause you to miss an exam, contact the instructor as soon as possible (no later than 24 hours after the test) for approval to reschedule the exam.**

5. COURSE EVALUATIONS. It is important to us that students provide feedback on the structure and instruction of MAC 2233 by completing an online evaluation at evaluations.ufl.edu. The system is open during the last three weeks of the semester.

PREREQUISITES FOR MAC 2233

This course assumes that you have a sound precalculus background. The following is a summary of some important concepts and required skills used in solving calculus problems, and we expect that you know this material for exams. The textbook provide a more complete review of these essential topics.

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

Triangle: area = $\frac{1}{2}bh$

Circle: area = πr^2 ; circumference = $2\pi r$

Parallelogram: area = bh

Rectangular box: volume = lwh

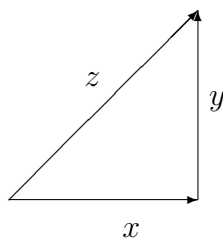
Sphere: volume = $\frac{4}{3}\pi r^3$; surface area = $4\pi r^2$

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

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: $x^2 + y^2 = z^2$ for the right triangle shown below.



2. **Basic Functions and their graphs:**

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

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

3. **Factoring:**

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2); x^3 - y^3 = (x - y)(x^2 + xy + y^2); \text{ etc.}$$

4. **Fractions:**

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

5. **Exponents:** For appropriate values of x , m and n ,

$$x^n y^n = (xy)^n; x^n x^m = x^{n+m}; \quad \frac{x^n}{x^m} = x^{n-m}; (x^n)^m = x^{nm}$$

6. **Roots**, including rationalizing the denominator or numerator.

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

7. **Inequalities and absolute values:**

$$|x| \leq a \quad -a \leq x \leq a; \quad |x| > a \quad x > a \text{ or } x < -a$$

8. **Equation solving:** Finding solutions for x if

$$ax + b = 0; ax^2 + bx + c = 0; \text{ etc.}$$

9. **Logarithms:** For a given base $a > 0$, $a \neq 1$:

$$\text{If } x > 0, \log_a x = y \text{ if and only if } x = a^y$$

$$\text{If } m > 0 \text{ and } n > 0, \text{ then}$$

$$\log_a (nm) = \log_a (n) + \log_a (m) \quad \log_a \left(\frac{n}{m} \right) = \log_a (n) - \log_a (m)$$

$$\log_a (n^c) = c \log_a (n)$$