

**MAC 2233: Survey of Calculus
Online Version
Spring 2016
Syllabus, Calendar, Grading**

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MAC 2233
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MAC 2233 Online: Calendar, Spring 2016

	Monday	Tuesday	Wednesday	Thursday	Friday
Introduction Review of Basics	January 4	5 Course Introduction	6 Precalculus Diagnostic Test	7	8 Precalculus Review, sec. R1-7
Module 1	11 Syllabus Quiz in Canvas* Lecture 1	12 Precalculus Review Assignment, Quiz*	13 Lecture Quiz 1* Lecture 2	14	15 Lecture Quiz 2* Lecture 3
Module 2	18 Lecture Quiz 3* Lecture 4	19 Quiz 1, L1 – L3*	20 Lecture Quiz 4* Lecture 5	21	22 Lecture Quiz 5* Lecture 6
Module 3	25 Lecture Quiz 6* Lecture 7	26 Quiz 2, L4 – 6*	27 Lecture Quiz 7* Lecture 8	28	29 Lecture Quiz 8* Lecture 9
Module 4	Feb 1 Lecture Quiz 9* Lecture 10	2 Quiz 3, L7–9*	3 Lecture Quiz 10* Lecture 11	4	5 Lecture Quiz 11* Lecture 12
Exam 1 Review Module 5	8 Exam Review	9 Discussion Post Due Quiz 4, L10 -- 11*	10 Study for Exam 1	11 EXAM 1**, L1 --11	12 Lecture Quiz 12* Lecture 13
Module 6	15 Lecture Quiz 13* Lecture 14	16 Quiz 5, L12 -- 13*	17 Lecture Quiz 14* Lecture 15	18	19 Lecture Quiz 15* Lecture 16
Module 7	22 Lecture Quiz 16* Lecture 17	23 Quiz 6, L14 -- 16*	24 Lecture Quiz 17* Lecture 18	25	26 Lecture Quiz 18* Lecture 19
Spring Break	Feb 29—March 4 No new module this week! Enjoy your break.				
Modules 8, 9	7 Lecture Quiz 19* Lecture 20	8 Quiz 7, L17 -- 19*	9 Lecture Quiz 20* Lecture 21	10	11 Lecture Quiz 21* Lectures 22, 23
Module 10	14 Lecture Quiz 22* Lecture 24	15 Quiz 8, L20 -- 22*	16 Lecture Quiz 23* Lecture 25	17	18 Lecture Quiz 24* Lecture 26
Exam 2 Review Module 11	21 Lecture Quiz 25* Exam Review	22 Discussion Post Due Quiz 9, L23 -- 25*	23 Study for Exam 2	24 EXAM 2**, L12 -- 25	25 Lecture Quiz 26* Lecture 27
Module 12	28 Lecture Quiz 27* Lecture 28	29	30 Lecture Quiz 28* Lecture 29	31 Quiz 10, L26 -- 28*	April 1 Lecture 29
Module 13	4 Lecture Quiz 29* Lecture 30	5	6 Lecture Quiz 30* Lecture 31	7 Quiz 11, L29 -- 30*	8 Lecture Quiz 31* Lecture 32 UF Drop Deadline
Exam 3 Review Module 14	11 Lecture Quiz 32* Lecture 33 Exam Review	12 Discussion Post Due Quiz 12, L31--32*	13 Study for Exam 3	14 EXAM 3**, L26 -- 32	15 Lecture 34
Module 14	18 Lecture Quiz 33* Lecture 35	19 Lecture Quiz 34*	20 Lecture Quiz 35*	21 Quiz 13, L33 -- 35*	22 Last date to work on MML 1 -- 13*
FINAL EXAM: Tuesday, April 26, 5 – 10PM (schedule a two hour time block with Proctor U)					

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

Homework, Quizzes in MyMathLab. You must earn 80% on a MML assignment before you can take the quiz on that material. You can still work on the assignments until April 22.

****Exams 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, 2/11; Exam 2, 3/24; Exam 3, 4/14**

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 ISIS homepage isis.ufl.edu; click on Placement under My Online Services. For more complete information, check the page isis.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.

The textbook for MAC 2233 begins with a short review of precalculus topics including a short diagnostic test, 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 on ISIS 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 Tuesday, January 18 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 at the UF or local bookstores, or online through MyMathLab. You may access MyMathLab directly in CANVAS, as a tool on the left sidebar of any course page.

If you prefer a hard copy of the text, you may purchase the bundle which includes the text and MyMathLab access code from the UF or local bookstores. You may also purchase a used copy. **The hard copy is not required.**

Note: we do not recommend purchasing a used bundle online since the access code may not function correctly, but you can certainly purchase a used text online and the access code directly from MyMathLab as indicated above.

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, or you may check the link <http://www.pearsonmylabandmastering.com/northamerica/mymathlab/system-requirements/>. 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.

2d. COURSE CALENDAR. Check the course calendar and CANVAS for due dates and plan your schedule accordingly.

2e. CANVAS., UF Online's course management system, is accessed through lss.at.ufl.edu. Use your Gatorlink username and password to log in. All course information including the course homepage, syllabus, homework assignments, lecture notes and test locations 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 Mrs. Smith or 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 weekly following the schedule posted on the course calendar. To help you test your understanding, there are questions included in each lecture. You will also 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 online office hours! The Broward Teaching Center at UF also provides 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.

Note: The lecture notes and other documents posted on the Getting Started and module pages in CANVAS are in PDF format which requires Acrobat Reader. You may download the latest version through <http://get.adobe.com/reader/>.

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 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 online office hours or on the discussion board, in email with your instructor, or through the Broward Teaching Center; 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! As mentioned, we encourage you to seek help from your instructors and your peers via office hours and the discussion board in CANVAS, and to use the Broward Teaching Center, teachingcenter.ufl.edu, for on-line tutoring services. 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/.

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.

3. GRADING AND COURSE REQUIREMENTS

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

MyMathLab assignments	55
MyMathLab quizzes (best 11 of 13, 5 points each)	55
Lecture Quizzes (best 33 of 35, 1.5 points each)	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+	365 - 379 pts.	73% - 75.8%
A-	435 - 449 pts.	87% - 89.8%	C	335 - 364 pts.	67% - 72.8%
B+	420 - 434 pts.	84% - 86.8%	C ^{-*}	320 - 334 pts.	64% - 66.8%
B	400 - 419 pts.	80% - 83.8%	D+	310 - 319 pts.	62% - 63.8%
B-	380 - 399 pts.	76% - 79.8%	D	285 - 309 pts.	57% - 61.8%
E	less than 285 pts.	or below 57%			

***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, 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 instructor before finals week for departmental approval and must provide documentation of the extenuating circumstances preventing him or her from completing course requirements. **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 math.ufl.edu/department/incomplete-grades/

Missing a final exam due to negligence, however, 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 the 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 noteshell 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. Viewing the lecture presentations is an important aspect of the learning process. 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 several lecture questions included each lecture. You should 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. The due dates for the Lecture Quizzes are posted on the course calendar. 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 planned to review concepts and to provide practice of the lecture material. Homework assignments will be posted with each module. Your point score on each assignment will be added and the total will count for 55 points of your final grade.

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 you solve each question.

MyMathLab homework for each module will open two weeks before the quiz deadline. **There are no makeups or drops for online homework. Do not try to complete an assignment in one sitting; 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 assignments through the end of the semester to raise your homework grade. The homework assignments will remain open until April 22 at 11:59PM. There will be a 5% penalty on those questions not completed by the original due date.

3g. MYMATHLAB QUIZZES. Thirteen five 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 80% on the corresponding MyMathLab assignment 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 and are due by 11:59PM on the due dates (either Tuesday or Thursday). 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 ten quiz scores from quizzes 1 – 12, plus your quiz score from quiz 13, will count for a total of 55 points of your 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 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 32% 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. The more active you are on the discussion board, the more credit you can earn.

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.

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 3 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 three 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 grade is higher than the lowest of your three semester exam scores, its percent score prorated to 80 points will replace that lowest test. For example, if your lowest semester exam score is 56 and you earn 80% (80 points) on the final, the exam score of 56 will be replaced by 64 (80% of 80 points) in the

gradebook. If the final exam score is lower, however, the original semester test score will remain.

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 for all students to provide feedback on the structure and instruction of MAC 2233 by completing an online evaluation at evaluations.ufl.edu. The system is open from April 9 – April 22.

Be sure to check the next pages for a summary of concepts and ideas needed to solve calculus problems.

PREREQUISITES FOR MAC 2233

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 provide 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 = πr^2 ; circumference = $2\pi r$

Parallelogram: area = bh

Rectangular box: volume = lwh

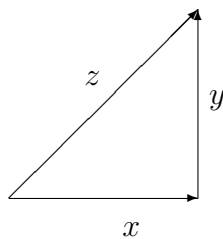
Sphere: volume = $\frac{4}{3}\pi r^3$; surface area = $4\pi r^2$

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: $x^2 + y^2 = z^2$



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: $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$, 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: If $x > 0$, $\log_a x = y$ if and only if $x = a^y$

If $m > 0$ and $n > 0$, then

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

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