

**MAC 2233: Survey of Calculus  
Online Version  
Summer 2017  
Syllabus, Calendar, Grading**

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**MAC 2233**  
**COURSE POLICIES and SYLLABUS**

1. Calendar	page 2
2. Introduction	
(a) Course Description, Content	page 3
(b) Prerequisites	page 3
(c) Required Materials	page 4
(d) Course Calendar	page 4
(e) CANVAS	page 4
(f) Lecture Videos	page 5
(g) Success	page 5
(h) Students with Learning Disabilities	page 6
(i) Academic Honesty	page 6
3. Grading and Course Requirements	
(a) Course Grade	page 7
(b) Incomplete Grades	page 8
(c) Getting Started, Syllabus Quiz	page 8
(d) Modules	page 8
(e) Videos and Lecture Questions	page 8
(f) MyMathLab Homework	page 9
(g) MyMathLab Quizzes	page 9
(h) Makeup policies	page 9
(i) Extra Credit	page 10
(j) Additional Practice Problems	page 10
4. Testing	
(a) Semester Exams	page 10
(b) Final Exam	page 10
(c) Makeup Exam Policies	page 11
5. Course Evaluations	page 11
6. MAC 2233 Prerequisites and Formulas	page 12

MAC 2233 Online, Summer C 2017

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY			
May 8th Lecture 1 First day of class	1	9th MML Precalculus Review HW Sec. R1-7 <small>Last Day to ADD/DROP</small>	10th Lecture 2 Precalculus Review Assignment Quiz (in MML)	2	11th <b>Syllabus Quiz</b> (In Canvas)	12th Lecture 3	3
15th Lecture 4 MML HW 1	4	16th MML Quiz 1	17th Lecture 5	5	18th	19th Lecture 6	6
22nd Lecture 7 MML HW 2	7	23rd MML Quiz 2	24th Lecture 8	8	25th	26th Lecture 9 <small>Withdrawal with 25% Refund</small>	9
29th Lecture 10 MML HW 3	10	30th MML Quiz 3	31st Lecture 11	11	June 1st MML HW 4	2nd Lecture 12 MML Quiz 4	12
5th Lecture 13	13	6th <b>Exam 1</b>	7th Lecture 14 MML HW 5	14	8th MML Quiz 5	9th Lecture 15	15
12th Lecture 16	16	13th MML HW 6	14th Lecture 17 Lecture 18	17	15th MML Quiz 6	16th Lecture 19	18
19th <u>Summer Break</u>		20th <u>Summer Break</u>			21st <u>Summer Break</u>		
26th Lecture 20 MML HW 7	19	27th MML Quiz 7	28th Lecture 21	20	29th	30th Lecture 22	21
July 3rd Lecture 23 MML HW 8	22	4th MML Quiz 8	5th Lecture 24	23	6th	7th Lecture 25	24
10th Lecture 26 MML HW 9	25	11th MML Quiz 9	12th Review for Exam 2	26	13th <b>Exam 2</b>	14th Lecture 27	27
17th Lecture 28 MML HW 10	28	18th MML Quiz 10	19th Lecture 29	29	20th Lecture 30	21st Lecture 31	30
24th Lecture 32 MML HW 11	31	25th MML Quiz 11	26th Lecture 33	32	27th MML HW 12 MML Quiz 12	28th <b>Exam 3</b> <small>Drop Deadline</small>	33
31st Lecture 34	34	Aug 1st Lecture 35	2nd MML HW 13 MML Quiz 13	35	3rd Review for Final	4th <b>Final Exam</b> <small>Last day of class</small>	36

\*All dates are the final due dates for the quiz, review or homework. Work must be completed by 11:59pm and MML means the assignment is in MyMathLab

## 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<sup>-</sup>) 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 Student Self Services homepage <https://student.ufl.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.

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.

If you feel you are not ready for MAC 2233 after you attempt the Precalculus Review in MyMathLab, you should consider dropping by May 9, 2017 and taking MAC 1140.

## 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 bookstore or online through MyMathLab. 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 which is accessed through 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](mailto: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 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](https://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 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.

**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 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](http://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/](http://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/](https://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	50
MyMathLab quizzes (best 11 of 13, 5 points each)	55
Lecture Quizzes (35 quizzes, 1.5 points each, capped at 50)	50
3 Semester Exams (80 points each)	240
Final exam	<u>105</u>
	<b>500</b>

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 <sup>-*</sup>	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%
D-	280 - 284 pts.	56% - 56.8%	E	less than 280 pts.	or below 56%



**\*NOTE** A grade of C<sup>-</sup> 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](http://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/](http://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 due on the date 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 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 50 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. 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 (see calendar for due dates). 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 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. 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 105 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% (84 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](https://evaluations.ufl.edu). The system is open during the last three weeks of the semester.

**Be sure to check the next pages for a summary of precalculus information needed to solve calculus problems. We expect that you know this material for exams.**

## 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. 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 =  $\pi r^2$ ; circumference =  $2\pi r$

Parallelogram: area =  $bh$

Rectangular box: volume =  $lwh$

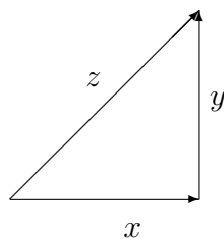
Sphere: volume =  $\frac{4}{3}\pi r^3$ ; surface area =  $4\pi r^2$

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

Right circular cone: volume =  $\frac{1}{3}\pi r^2h$ ; 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  $a > 0$ ,  $a \neq 1$ :

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

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

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

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