

# MAC 2312: Calculus II, Summer C 2021

## Synchronous Sections 11924, 11927, 11928

### CONTACT INFORMATION:

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**Office Hours:** See Canvas Homepage

**Text:** There is no required text book for this course. You may use any calculus book as reference. For instance, [Calculus Early Transcendental by Stewart \(solution\)](#) is a great reference book, any edition is good. A free open source textbook, [Openstax](#) is also another good option. I encourage you to use the online Guided Learning Calculus 2 ([GLC2](#)).

**Lecture Outline:** You may print them off from Canvas by clicking on the Syllabus tab on the left side in Canvas, then scroll down to Course Resources to find a table of lectures and outlines.

**Course Management System:** [CANVAS](#)

**Homework, Quizzes, Exams(all online):** Access them using the Assignment tab in Canvas.

**UF Free Tutoring Service:** [Broward Teaching Center](#)

## MAC 2312 -- ANALYTIC GEOMETRY & CALCULUS II

1. Course Calendar .....	page 3
2. Introduction	
a. Course Description, Content .....	page 4
b. Prerequisites .....	page 4
c. Required Materials .....	page 4
d. Assignment Calendar .....	page 5
e. CANVAS .....	page 5
f. Lecture Videos .....	page 5
g. Success .....	page 5
h. Students with Disabilities .....	page 6
i. Academic Honesty .....	page 7
3. Grading	
a. Course Grade .....	page 7
b. Incomplete Grades .....	page 8
c. Getting Started, Syllabus Quiz, .....	page 8
d. Videos and Lecture Questions .....	page 8
e. Homework .....	page 8
f. Exams .....	page 9
g. Extra Credit .....	page 9
h. Additional Practice Problems .....	page 9
4. Testing (page 10)	
a. Semester Unit Exams .....	page 10
b. Final Exam .....	page 10
c. Makeup Policies .....	page 10
5. Formulas You Are Expected to Know .....	page 11

## MAC 2312 Synchronous Sections Course Calendar, Summer 2021

Lecture Video:	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1(L1-4) 5/10	Class Begin LQ1	LQ2	Syllabus quiz HW1(L1-2)	LQ3	LQ4
Wk 2(L5-8) 5/17	LQ5	LQ6 Q1(L1-4)	HW2(L3-4)	LQ7	LQ8
Wk 3(L9-13) 5/24	LQ9 HW3(L5-6)	LQ11-12, Q2(L5-8)	HW4(L7-9)	LQ13 UPL1(HW1-3)	LQ10
Wk4(L14-15) 5/31	HW5(13) HW6(L1-13)	Q3(L9-13), DIS1 UPL2(HW4-6), UE1R	2 Exam1 (L1-13)	LQ14	LQ15
Wk 5(L16-19)6/7	LQ16	LQ17, Q4(14-15)	HW7(L14-15)	LQ18	LQ19
Wk 6(L20-23) 6/14	LQ20 HW8(L16-17)	LQ21 , Q5(16-19)	HW9(L18) HW10(L19)	LQ22	LQ23 HW11(20)
Wk 7 6/21	Summer	Break	Summer	Break	Week
Wk 8(L24-25) 6/28	Exam Rev. HW12(L21-22) HW13(L14-23)	E.R. Q6(L20-23), DIS2 UPL3(HW7-13), UE2R	30 Exam2 (L14-23)	LQ24	LQ25
Wk 9(L26-28) 7/5	HW14(L24)	LQ26, Q7(L24-25)		LQ27 HW15(L25-26)	LQ28
Wk10(L29-32) 7/12	LQ29 HW16(L27-28)	LQ30, Q8(L26-29)	HW17(L28-29) HW18(L24-29)	LQ31, UPL4 (HW14-18)	LQ32
Wk11(L33-35) 7/19	LQ33 HW19(L30-31)	LQ34 , Q9(L29-32)		LQ35	Review HW20(32-34)
Wk12(L36-37) 7/26	Review HW21(L30-35)	Review Q10(L33-35), DIS3, UPL5(HW19-21),UE3R	28 Exam3 (L24-35)	LQ36	LQ37
Wk13 8/2	Rev. HW22(L36-37) HW23(L36-37)	Q11(36-37), DIS4 UPL6(HW22-23),UE4R	Verify grades	5 Final (L1-37)	Class Ends

**All exams: open from 1AM – 11:59PM, proctored by Honorlock. Begin exam no later than 6pm EST (no later than 5pm EST for finals).**

L11 (limits), L12 (L'Hospital's Rule): Calculus 1 Review lessons. L10, 23,35: mini unit review lessons.

- All homework assignments are open at the beginning of the term and due at 11:59 pm on due dates. You may always complete them early if you have other plans, but not late. No extensions!
- UPLn – Upload Written Homework n Due. UEnR- Upload Exam n Review Due.
- Ln-Watch lecture n video before class; LQn- answer a few questions related to that lesson.
- Discussions (Extra Credits) on Exam n material: (DISn), see Discussions Forum for more details.
- All due dates in the calendar are absolute last date the assignment is to be received by Canvas. You may always complete and submit assignments early, except for the exams which must be taken in the specified periods. **Due date is NOT Do date.** If you wait to submit and you run into issues, **you will be out of luck.** Aim to have work submitted 24 hours prior it's due, save the Due date for last minute emergency.
- If you joined the class late, please contact your TA for due dates extension of the first week work.
- You will have one week from when a score is posted to discuss grading with your TA. Verify and resolve all Canvas grade issues either within 1 week after the grade is posted or by the last Wednesday of the term, whichever comes first (except for the final exam). Absolutely NO grade disputes/discussion after the term is over.

## 2. INTRODUCTION

**2a. COURSE DESCRIPTION and CONTENT.** MAC2312, Calculus II, is the 2<sup>nd</sup> semester in the three semester calculus sequence. The course begins where MAC2311 left off at integration techniques, followed by a study of infinite sequences and series, parametric equations and polar coordinates and closed with some applications of definite integrals finding volumes. A minimum grade of C (not C –) in MAC 2312 satisfies four credits of the University General Education Mathematics requirement.

This is the Synchronous section of MAC2312 –Students view 37 online **lecture videos** prior to attend synchronous lectures. Complete **lecture quizzes** in the course management system Canvas as attendance points. Students also complete **online homework and upload their written work** in Canvas. Students are encouraged to **post** questions and answers on the course **Discussions Board** in Canvas. **Three unit exams** and a cumulative **final exam** are posted in Canvas and administered through Honorlock. **There is no drop of any exams. You must take an exam on the specified date.**

**2b. PREREQUISITES.** MAC2312 assumes that you have essential PreCalculus skills (both Algebra and Trigonometry) as well as the calculus 1 skills necessary to succeed in this course. Students should be able to do arithmetic without a calculator. In the last section of this syllabus, students may find a short list of review materials to practice as well as in L11 (limits) & L12 (L'Hospitals' Rule).

Appropriate score on the ALEKS placement assessment, or a grade of C or better in UF MAC2311 meets the *minimum* requirement for the course. We encourage students to review the prerequisite material to gain a strong knowledge in order to succeed in calculus II. MAC2312 begins with integration chapter, you should already be competent in integrating simple functions and the use of u-substitution. We strongly recommend students who are having difficulty with these core calculus skills to review MAC2311 (or take the course if you have not done so). You may switch courses on one.ufl.edu during the drop-add period.

### 2c. REQUIRED MATERIALS.

**Lecture Notes Outlines:** See 2f.

**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. Be sure you are using only **Chrome** that works with Honorlock.

- **DueDate is NOT DoDate.** Internet sometimes is not reliable, a reason you should not wait till **last hour** to complete your online assignment. If your computer or internet goes down while you try to submit an assignment, you will need additional time. If you **miss a due date**, no credit will be given for the work not submitted.
- Always allow plenty time to submit your work after you have prepared them thoroughly. It's **student's responsibility** to have a reliable computer, a good internet and good wifi speed and to verify your work is submitted successfully before the deadline.

**Calculators:** A graphing calculator or computer program can be useful as a learning tool when used appropriately, but they are not essential. I recommend the online graphing tool [Desmos](#). Calculus is a collection of concepts, ideas and process that are not mastered through calculator skills. **No calculators** are allowed during quizzes or exams (except the simple calculator provided in Honorlock).

**2d. ASSIGNMENT CALENDAR.** Check the course calendar for due dates and plan your schedule accordingly. **You may complete your homework early, but you must take exams on the assigned dates. A 20% late penalty per day is incurred to allow students to turn in homework 1 day late.** You may do more lessons and complete them early if you have plans.

**NOTE:** You may review a homework, but be sure not to unintentionally **re-submit** your assignment unless you mean to submit it for a grade. Canvas takes your **last** submission and assigns it a new grade, and if it is late, a late penalty will apply. Be sure **NOT** re-submit it again if you are only reviewing for practice.

**2e. CANVAS.** A UF courses management system, is located [here](#). Use your Gatorlink username and password to login. All course information including your grade, course homepage, syllabus, lecture outlines, lecture videos, office hours, discussions forum, free help information, exam, mail tool...etc. can be accessed from this site.

You are responsible for verifying that your grades are accurate. **You have one week after a score has been posted to contact your TA if you believe there has been a recording error and have it resolved immediately. There is absolutely no grade dispute at the end of the term.**

**Please note:** Important course information is clearly communicated in this syllabus, and the links and information in Canvas. Due to the volume of email received by the instructor and TA, we can not reply to each request for this well publicized information. If you can not find your answer in the resources above, there is also a **Discussions Forum** available in CANVAS. Use this to post questions and to supply answers to your fellow classmates.

**TURN ON ALERTS** from Canvas so that you get timely course information in your UF email. Under Notifications (located under Account on the upper left of your Canvas with your profile picture), turn on “Daily or ASAP” notification for Announcement, Discussions and Grading. Click [here](#) for more information.

**2f. LECTURE VIDEOS.** The lecture videos provide the main presentation of course material. You may access each video directly through each Lecture on Canvas Home Page. Re-watch it if necessary.

- To stay current with the course, you must watch the lecture video weekly following the schedule posted in the course calendar. Start early and stay ahead so you don't miss the due dates.
- You should watch the lectures and answer the corresponding Lecture Quiz in Canvas before attempting homework.
- It's possible to **get ahead** in this class if you complete each assignment early, but you must take exams on the specified dates. **If you have other commitment, adjust your schedule to complete the assignments earlier rather than later.**

**Lecture Notes Outlines:** It is important that you should have a paper copy of the lecture outlines. This will make it easier to take notes and to follow the lecture when watching the videos. You may print them out from each lecture in Canvas or purchase the printed packet from [Target Copy](#) (if you are in Gainesville).

**2g. SUCCESS:** Other than having a strong precalculus and calculus I background, success in MAC 2312 depends largely on your attitude and effort. **Keeping up with the videos is critical.** You may find it beneficial to **work daily** on the material as opposed to saving it all for one day. It is not effective to watch

video and copy notes without following the thought processes involved in the lecture. For that reason, there are Lecture Quizzes for each lecture which you will need to submit the answer in Canvas as part of your course grade. (see 2f and 3d)

**EXPECTATION: This is a very challenging course. Treating it as anything less than that is inherently unwise, both for your learning and for your grade. Be aware that much of the learning of mathematics at the university takes place outside of the classroom** (in the case of an online class, additional time working on the material after watching the lecture videos). **“At a minimum”** we expect students to spend 3 hours effectively studying on your own (in addition to watch the lecture video) for every credit hour of the course. MAC 2312 is a 4 credit course, which means **at least 12 hours per week** preparing and practicing problems for this course **in addition to watch lecture videos**. If you are not doing as well as you would like in MAC 2312, you may need to put forth more effort. Keep in mind that the goal is to be able to apply the techniques of calculus to problems, not just reproduce the problems you see in class.

Do you know that it takes roughly 45 lecture hours in colleges vs. roughly 150 lecture hours in high school to complete a calculus course? The fact of the matter is that college course goes **3+ times faster** and that **you probably won't do well if you don't watch lecture regularly or wait till the week of the exam to start preparing for the exam**. Much of the learning is on you. **Therefore, it is critical that you keep pace with the course material and assignments each week**, Practice, practice and practice. Do not fall behind.

Use the resources available as you study! We encourage you to ask questions, seek help from online office hours, Discussions Board and the [Broward Teaching Center](#), for free online tutoring services. Do not let misunderstandings go unanswered.

We encourage students to work together, and an important resource to facilitate **communication** in an online course is the **Discussions Board** in CANVAS. You should check the Discussions Board **regularly**, posting questions and answers. The effort of asking questions, communicating ideas with fellow students, 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, a friend or calculator ‘think’ for you. Be sure to compare the material from tutors, if you use one, with the class material and ask questions to make sure that you can work out problems completely on your own before an exam. Be a responsible learner!

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

**2h. STUDENTS WITH DISABILITIES.** UF welcome students with disabilities into the UF programs. Students requesting classroom accommodations must first register with the Dean of Students Office [Disability Resource Centr \(DRC\)](#) , (352-392-8565). The DRC will provide documentation to the student who must then provide this to the instructor as soon as possible when request accommodation. (see Section 4.)

## 2i. ACADEMIC HONESTY.

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 conduct set forth hereinafter constitutes a violation of the Academic Honesty Guidelines (University of Florida Rule 6C1-4.017)

The mathematics department expects you to follow the Student Honor Code. We are bound by university policy to report an 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, notes and GLC2 are the property of the University/faculty member and may not be distributed/shared without prior permission from the coordinator and may not be used for any commercial purpose. Students found to be in violation may be subject to discipline under the Student Conduce Code.

## 3. GRADING

3a. COURSE GRADE. Your course grade is determined as follows:

Syllabus Quiz and Lecture Quizzes (drop 3 lowest LQ)	71 points
Online Homework Group 1 (drop 1 lowest)	34 points
Online Homework Group 2	30 points
Upload Homework	30 points
Upload Exam Review	20 points
Quiz (drop 1 lowest)	100 points
<u>3 Unit Exams(100 each) &amp; cumulative Final(115)</u>	<u>415 points</u>
Total:	700 points

In addition, there are extra credits opportunities (see 3g).

Your course grade will be determined according to the following scale.

**There will be no additional curve in this course, extra assignments for individual students to improve a grade are NOT possible.**

A	630 and up	C	490 and up
A –	609 and up	C – *	469 and up
B +	588 and up	D+	448 and up
B	560 and up	D	420 and up
B –	539 and up	D –	350 and up
C +	518 and up	E	below 350

\*Note: A grade of ‘C –’ or lower DOES NOT give University General Education credit!

For those taking the ‘S – U’ option: S[ > 70%]      U[ < 70%]

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.

**3b. INCOMPLETE GRADES POLICY.** Students who are currently passing a course but are unable to complete the course because of illness or emergency may be granted an incomplete grade of I which will allow the student to complete the course within the first two weeks of the following semester. See the policy on the [math department criteria](#). If you meet the criteria you must see the instructor before the beginning of the finals week to be considered for an I. **A grade of “I” only allows you to make up your incomplete work, not redo previously completed work, nor closed work.**

### **3c. GETTING STARTED - START HERE: INTRODUCTORY VIDEO, SYLLABUS QUIZ.**

Log in to Canvas and familiarize yourself with the syllabus and the information in the links in Canvas. After you feel comfortable with the course policies, take the **syllabus quiz** in Canvas. The syllabus quiz is to make sure you understand what is expected of you in this course. After you have completed the syllabus quiz, you are ready to move to the main content: Lecture 1 – Lecture 37.

**3d. VIDEOS AND LECTURE QUESTIONS.** MAC2312 is organized into 37 lectures, each lecture has an introductory page including the concepts to be covered, things you need to do for this lecture. Go to Canvas Homepage to access each lecture. From there, you may access a copy of the note outlines, link to the **lecture videos** and link to the **homework**. Viewing the video is an important aspect of the learning process. There is a **Lecture Quiz** to be completed in each lecture. We encourage you to use the notes as well as the videos or the Discussions Board to help answer these questions.

**NOTE:** At the time of the taping, we used a specific text book. Please go by the ‘topic name’ and not any chapter numbers mentioned in the videos.

**NOTE:** There might be minor typos in some of the lecture videos. Post them in Discussion Board if clarification is needed.

**3e. HOMEWORK.** There are online homework as well as written homework:

1. **Online Homework** (Lecture Quiz n & HWn in group 1 and group 2)– You may access online assignments in Canvas. You may access the *Lecture Quizzes* within each lecture on Canvas homepage or, by clicking on the Assignment tab on the left side of Canvas. Three lowest Lecture Quiz scores and one lowest HWn in group 1 will be **dropped** to offset possible credit lost due to



technical issues or a missed assignment or simply a bad day. (note: Syllabus Quiz will not be dropped).

2. **Written Homework** – to be uploaded in Canvas:

There are two kinds of written homework assignments. Here, you get the opportunity to practice writing out complete math solution. The first one is the written work you have done while working on the Online Homework. Go to the Assignments tab in Canvas, click on ‘Upload Homework (UPLn)’. The second one is for *exam reviews*. Click on ‘Upload Exam Review (UEnR)’ to find the past exams and exam review to work on. Scan your completely worked out solution and upload them in a **single pdf file** before due date.

Do not try to complete all assignments in one sitting; Remember: **Due Date is NOT Do Date! Start and submit early so you won’t miss the deadline and have time to digest and absorb the material.**

**NOTE:** The purpose of homework is to practice problems in order to understand and master the material learned. Complete them before each exam. **Complete them after exams is not helpful to your learning nor your grades.**

Contact your instructor immediately if you are experiencing problems. You may also post questions in the Discussions Board.

**NOTE:** Post your *math questions* to the discussions board. *Do not use email for math problems or non-private issues.*

**3f. EXAMS.** See 4. TESTING.

**3g. EXTRA CREDIT.** Earn bonus points via Discussions Board, Exam3 and Final Exam review quizzes and Practice quiz. These points will be added to your total course grade, be sure to take advantage of them.

**3h. ADDITIONAL PRACTICE PROBLEMS.** There are also problems listed at the end of each lecture in the lecture note outlines, called ‘Now You Try It’ (**NYTI**). These were written by the course coordinator and are designed to emphasize important concepts and provide extra practice of the lecture material. Some of them are included in the Lecture Quiz as well. NYTI problems are not graded, but it is strongly encouraged that you work them out. **Solutions to NYTI are posted in the ‘Lecture Notes’ table** under Course Resources in Canvas. There are also 277 extra practice problems posted in Course Resources.

## **4. TESTING.**

There are three 90-minute unit exams and one two-hour **cumulative** final exam. The exams will be given in Canvas and administered through Honorlock. All exams are open from 1AM – 11:59PM EST only. Exams close at 11:59pm or when your time is up, whichever comes first. You should start your exam no later than 6pm EST (or 5pm EST for the final exam) to ensure you have maximum time to work on your exam.

**Make sure you are available to take the exam at the designated date.**

**Possible connection issues, temporary internet issues during exams:**

*We offer **double time** on all exams to compensate for possible internet problems, or any other technical issues that may arise, wait time to communicate with the Honorlock support.*

**Honorlock:** See *Course Information in Canvas*. We urge you to **Livechat with Honorlock Support at least a few days prior to your exam** to confirm your connection speed and required equipment are all good. It is your responsibility to be sure that you have a reliable Ethernet internet connection and verify with the proctor for an acceptable internet speed, location & environment (ex. webcam, speaker, mic) to ensure that it meets proctoring requirements. **If your answers are not received by Canvas due to your faulty connection/equipment, they are lost for good, we are not able to take anything else to replace your lost answers.**

**Do not request a retake** for any exam unless you have documented evidence that your disconnect or technical issues **exceeded double time and it is not due to your negligence**. It's your responsibility to have a reliable internet connection and fast enough computer/internet speed, do a 'speed check' with Honorlock before your exam, disable Acceleration in Chrome. You will not be able to request a makeup exam if problems arise due to your own negligence.

Use **Chrome** while working on math equations, it's known that math images may not be displayed properly in other search engines, and Honorlock requires Chrome to work.

**HonorLock:** Please be sure to obtain Chrome and download the Honorlock Google Chrome Extension and disable Acceleration in Chrome. Check out Exams and Honorlock in [Course Information](#) in Canvas.

**If you are uncertain as to the reliability of your internet service provider or internet connection, find a place to take your exam where the connection is reliable.**

Do not disconnect webcam before you have submitted your quiz/exam. **Failure to do so may result in a 0.**

**4a. SEMESTER UNIT EXAMS.** Each Unit Exam will be given in Canvas consisting multiple choice questions and possibly a few fill-in-the-blank questions. Your exam score is displayed immediately after your submission. The exam is locked after the test. You may request a 20 minutes private conference within one week after each exam to review your exam with your instructor.

**4b. FINAL EXAM.** A mandatory, cumulative final exam in Canvas will be given on the date shown in the course calendar. The exam consists of multiple choice questions and possibly a few fill-in-the-blank questions. You may request 20 minutes private conference with your instructor to go over your final exam within 24 hours after the exam.

**4c. MAKEUP POLICIES.** Exams must be taken on the exam date, all make-up work must be arranged prior to the exam. This is an assembly exam (meaning large number multi-sections class)

### 1. Exam Conflicts

- a. If you have more than three exams on a particular date, you can contact the instructor of the lowest assembly exam or non-assembly exam and make arrangements to take a makeup exam. If this course is the one to give a makeup, contact your instructor or TA by the end of the second week to arrange for a makeup. See [UF Exam Policies](#).
- b. If you are participating in a UF sponsored event or religious observance, you may make up an exam only if you make arrangements with your instructor or TA by the end of the second week with a valid documentation.

## 2. Makeup – Exams:

- If **serious** illness or other last minute **extenuating** emergency circumstances cause you to miss an exam, you must contact your instructor (no later than 24 hours after the exam) by email, and send them the appropriate documentation. You may be denied a makeup exam if you do not have completed at least 75% of all the course work thus far and have not completed all prior exams.
- Contact your instructor immediately if you have court order on the day of the exam.

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

- Other make ups:** There are **no make-ups** on any assignments nor extra credit opportunities.

All unit exams makeups must be completed by the **last Monday** of the semester **before the final exam**.

Note: Information in this syllabus is subject to change. Any changes will be clearly announced in Announcements, Discussions or through email.

## 5. FORMULAS YOU ARE EXPECTED TO KNOW.

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

COMPLETING THE SQUARE       $x^2 + ax + b = (x + \frac{a}{2})^2 + (b - (\frac{a}{2})^2)$

LAW OF EXPONENTS       $a^{n+m} = a^n a^m$        $a^{n-m} = \frac{a^n}{a^m}$        $(a^m)^n = a^{mn}$

PROPERTIES OF logarithms       $\log_b |xy| = \log_b |x| + \log_b |y|$

$$\log_b \left| \frac{x}{y} \right| = \log_b |x| - \log_b |y|$$

$$\log_b |a^m| = m \log_b |a|, \quad \log_b |x| = \frac{\ln |x|}{\ln b}$$

PARABOLA       $y = f(x) = ax^2 + bx + c$       CIRCLES       $(x - a)^2 + (y - b)^2 = r^2$

Vertex       $x = -\frac{b}{2a}, y = f(-\frac{b}{2a})$       Center       $(a, b)$ , radius =  $r$

### Derivatives

$$\frac{d}{dx}(\sin x) = \quad \frac{d}{dx}(\csc x) = \quad \frac{d}{dx}(\cos x) = \quad \frac{d}{dx}(\sec x) =$$

$$\frac{d}{dx}(\tan x) = \frac{d}{dx}(\cot x) = \frac{d}{dx}(\arctan x) =$$

$$\frac{d}{dx}(a^x) = \frac{d}{dx}(e^x) = \frac{d}{dx}(\log_a x) = \frac{d}{dx}(\ln x) =$$

### Integrals

$$\int \frac{1}{x} dx = \int e^x dx = \int a^x dx =$$

$$\int \sin x dx = \int \cos x dx = \int \tan x dx = \int \cot x dx =$$

$$\int \sec^2 x dx = \int \csc^2 x dx = \int \sec x \tan x dx = \int \cot x \csc x dx =$$

$$\int \tan^2 x dx = \int \cot^2 x dx = \int \frac{1}{a^2 + x^2} dx =$$

### Trig Identities

$$\sin^2 x + \cos^2 x = 1 \quad \tan^2 x + 1 = \sec^2 x \quad 1 + \cot^2 x = \csc^2 x$$

$$\sin^2 x = \sin 2x =$$

$$\cos^2 x = \cos 2x =$$

Know values of  $\sin x$ ,  $\cos x$ ,  $\tan x$  at  $x = 0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ ;  $\arctan(a)$  at  $a=0, 1, \sqrt{3}, 1/\sqrt{3}$ .

(know the values of the other trig. functions at these angles and know the values of all trig functions at complementary and supplementary angles of the angles above)

### Chain Rules

$$(f(g(x)))' = f'(g(x))g'(x)$$

### Derivative of an Inverse

If  $g = f^{-1}$ , then  $g'(x) =$