

# MAC 2312 Syllabus

## SPRING 2017

**LECTURE:** MWF 5 & 8 (TURL007): Chui (coordinator)

LIT 376; Office hours: TBD; Email: chui@ufl.edu

**LECTURE:** MWF 3 (NRN137): Huang

LIT 372; Office hours: M7, W4, and F6; Email: Huang@ufl.edu

**(Please specify your lecture period, discussion section & TA's name in the Subject line of any email correspondence with us).**

### My Lecturer

Name: \_\_\_\_\_

Lecture Time & Location: \_\_\_\_\_

Office & Office Hours: \_\_\_\_\_

### My Discussion Leader (TA)

Name: \_\_\_\_\_

Discussion Time & Location: \_\_\_\_\_

Office & Office Hours: \_\_\_\_\_

Email: \_\_\_\_\_

**TEXT:** This course will be participating in the UF All Access program. The e-textbook, Calculus Early Transcendental by Stewart, is included in the required WebAssign access code. See **Online Homework** for an option with reduced price. Do not get the code directly from WebAssign.

## MAC 2312, Spring 2017

Monday	Tuesday	Wednesday	Thursday	Friday
		Jan 4 L1	5 First Thursday Discussion Class (L1)	6 L2
9 L3	10 First Tuesday Discussion Class (L1-L2)	11 L4	12 Discussion Class (L1-L3)	13 L5
16 MLK Day No Class	17 Integration WK due Quiz 1 (L1-L4)	18 L6	19 Integration WK due Quiz 1 (L1-L4)	20 sign up for conflict, make up exams deadline L7
23 L8	24 Discussion Class (L5-L7)	25 L9	26 Discussion Class (L5-L7)	27 L11
30 L12	31 Quiz 2 (L5-L11)	Feb 1 L13	2 Quiz 2 (L5-L11)	3 L14
6 L10	7 Discussion Class (L10, L12, L13) Exam 1*	8 L15	9 Discussion Class (L10, L12, L13)	10 L16
13 L17	14 Written HW1(L1-13) Quiz 3 (L14-L16)	15 L18	16 Written HW1(L1-13) Quiz 3 (L14-L16)	17 L19
20 L20	21 Quiz 4 (L17-L19)	22 L21	23 Quiz 4 (L17-L19)	24 L22
27 L24	28 Discussion Class (L20-L22)	Mar 1 L23	2 Discussion Class (L20-L22) Exam 2*	3 clicker registration due L25
Mar 6 – Mar10 Spring Break				
13 L26	14 Written HW2(L14-24) Discussion Class (L24-L25)	15 L27	16 Written HW2(L14-24) Discussion Class (L24-L25)	17 L28
20 L29	21 Quiz 5 (L26-28)	22 L30	23 Quiz 5 (L26-28)	24 L31
27 L32	28 Discussion Class (L29-31)	29 L33	D Discussion Class (L29-31)	31 L34
Apr 3 L35	4 Discussion Class (L32-L35)	5 L35	6 Discussion Class (L32-L35) Exam 3*	7 L36 Withdraw Deadline
10 L36	11 Written HW3(L25-35) Quiz 6 (L29-36)	12 L37	13 Written HW3(L25-35) Quiz 6 (L29-36)	14 L37
17 Review	18 Discussion Class (L37)	19 *clicker alert *verify all Canvas grades Review	20 Reading Day No Class	21 Reading Day No Class

**\*Evening Exam Time: 8:20 – 9:50PM. See Canvas for Exam locations.**

**- Cumulative Final Exam: Saturday, April 22, 10 AM – 12 Noon.**

**- Clicker registration deadline – successfully receiving weekly report with the correct grade.**

**\*clicker alert-Forfeit all clicker points** if still have not resolved all clicker issues by 4/19.

**\*Verify and resolve all Canvas grades issues: 4/19-25. Absolutely NO grades discussion after 4/26.**

## MAC 2312, WebAssign Homework, Spring 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
			Jan 4 L1	5	6 L2
8	9 L3	10 <b>Diag Quiz</b> <b>7.1P, 7.1C, 7.2P</b>	11 L4	12 <b>7.2C, 7.3P</b>	13 L5
15 <b>7.1M, 7.4P</b>	11 No Class	17 <b>7.2M</b>	18 L6	19 <b>7.3C, 7.8P</b>	20 L7
22 <b>7.3M, 7.4aC</b>	23 L8	24 <b>7.4aM, 7.4bC</b>	25 L9	26 <b>7.4bM</b>	27 L11
29 <b>7.4cC, 11.1P</b>	30 L12	31 <b>7.4cM, LimitR</b>	Feb 1 L13	2 <b>7.8C, L'HR</b>	3 L10
5 <b>7.8M, 7.5R</b>	6 L14	7 <b>Exam1R</b> <b>Exam 1*</b>	8 L15	9 <b>11.1C</b>	10 L16
12 <b>11.1M, 11.2aC,</b>	13 L17	14 <b>11.2bC, 11.2aM</b>	15 L18	16 <b>11.2bM</b>	17 L19
19 <b>11.3C</b>	20 L20	21 <b>11.4C, 11.3M</b>	22 L21	23 <b>11.4M, 11.5C</b>	24 L22
26 <b>11.5M, 11.6aC</b> <b>11.6aM</b>	27 L24	28 <b>11.6bc, 11.6bM</b>	Mar 1 L23	2 <b>11.7R</b> <b>Exam2R</b> <b>Exam 2*</b>	3 L25
5	Mar 6 – Mar10 Spring Break				
12 <b>11.8P, 11.8C</b> <b>11.9aC</b>	13 L26	14 <b>11.8M, 11.9bC</b>	15 L27	16 <b>11.9aM</b>	17 L28
19 <b>11.10aC</b>	20 L29	21 <b>11.9bM</b>	22 L30	23 <b>10.1-4P</b> <b>11.10aM</b>	24 L31
26 <b>10.1-10.2C</b> <b>11.10bC</b>	27 L32	28 <b>11.10bM</b> <b>Exam3R-I</b>	29 L33	30 <b>10.1-10.2M</b> <b>10.3C</b>	31 L34
2 <b>10.3M, 10.4aC</b> <b>10.4bC</b>	Apr 3 L35	4 <b>10.4aM</b> <b>10.4bC</b>	5 L35	6 <b>10.4bM</b> <b>Exam3R-II</b> <b>Exam 3*</b>	7 L36 <b>Withdraw</b> <b>Deadline</b>
9 <b>6.2P</b>	10 L36	11 <b>6.2C</b>	12 L37M	13 <b>6.2M</b>	14 L37
16 <b>6.3C</b>	17 Review	18 <b>6.3M</b>	19 Review <b>Final R</b>	20 Reading Day No Class	21 Reading Day No Class

**All WA assignments** are due 10PM on the dates specified on this calendar.

**Exam Review WA assignments** are extra credit.

**COURSE GRADE:** A student's grade will be based on 400 points accumulated as follows:

Lecture Participation (HITT clickers)	30
Online Homework (in WebAssign)	50
Written Homework (out of 3.5 points $\times$ <u>3</u> =10.5)	10
Discussion Quizzes (best 4 of 6, 5 points $\times$ <u>4</u> =20)	20
Semester Exams (70 points $\times$ <u>3</u> =210)	210
Cumulative Final Exam	<u>80</u>
	<b>400</b>

The course grade is determined by the number of points you earn, not by the percentage.

A	360 – 400 pts	C	280 – 293 pts
A–	348 – 359 pts	C–*	268 – 279 pts
B+	334 – 347 pts	D+	254 – 267 pts
B	320 – 333 pts	D	240 – 253 pts
B–	308 – 319 pts	D–	228 – 239 pts
C+	294 – 307 pts	E	0 – 227 pts

- There will be **NO DROP** on exam grades.
- Extra assignments or score adjustments for individual students to improve a grade are **NOT** possible.

### **LECTURE PARTICIPATION:**

- **H-ITT Clickers:**

**Attendance in lecture and in discussion are required.** In lectures, students are required to have a working H-ITT clicker. You may also use softclick. Go to the Course Resources of the Module tab in Canvas to look up detail information about using the clicker /Soft Clickers.

Starting approximately the second week of the semester, students will be required to have their clickers in class in order to participate in lectures. A weekly clicker grade report will be sent to students' UF email. **It's students responsibility to verify the scores and fix any problems immediately.**

There are **NO MAKEUPS**, however there will be a small excess of clicker points given over the course of the semester to compensate for occasional absence, mechanical failures, forget to bring the clicker, etc.

A student is not allowed to respond in class for anyone else but himself; a violation of this policy is considered cheating and will be handled according to standard University policies.

**NOTE:**

- Register your clicker immediately after your first successful use in lecture.
- If you are not receiving a weekly 'Clicker grade report' email after Friday, January 20, then you are most likely not properly registered. Contact the H-ITT representative (contact info is in Canvas Homepage) immediately to resolve all your registration issues.
- All clickers must be registered by Friday, March 3rd before the Spring Break. If you have not received a "Clicker Grade Report" email by then and/or you are seeing a 0 score for your H-ITT Clicker, then you are most likely not properly registered (unless you have not participated at all in class), expect to incur a severe penalty for allowing your Clicker to go unregistered for as long as you did.
- Any student who has not properly confirmed their clicker is registered and as a result receives a 0 for their H-ITT Clicker Point Grade by Wednesday, April 19 will forfeit all their clicker points. You can not earn these points back even if they are the difference between passing and failing.
- Verify your clicker grade in Canvas after Wednesday, April 19 and contact your instructor immediately if there are any recording errors. There will be absolutely **no discussion on any grade issues** after final grades have been submitted to the University Registrar on Wednesday, April 26.

• **Lecture Notes Outlines:**

Your instructor will use a **LECTURE OUTLINE** (may be purchased at Target Copy on University Ave or, print online in Canvas). Bring it to each lecture.

## **ONLINE HOMEWORK in WEBASSIGN:**

Students must purchase an access code for WebAssign (WA), which includes the text as an ebook and the online homework assignments. You have limited time (by 9/9/16) to 'opt-in' to WA access and the ebook through Canvas once classes begin for a reduced price of \$62.50 and pay for these materials through your student account. A print copy of the text is not required.

During the course of the semester, online assignments will be assigned on a routine basis and must be completed before the due dates listed in the Course calendar. within the given time interval. Students are responsible for having access to a working computer and have your work completed on time. Remember that Due Date is NOT Do Date. There will be **NO MAKE-UPS**. However, there will be few excess points given to compensate for any difficulties you may encounter.

You can request an extension on WA homework within 2 days after the deadline and you will have 48 hours to complete it after extension request. There will be 20% grade penalty for those problems completed after the original due date.

**NOTE:** The extension is submitted in WA directly and you must NOT select to view the answers before the extension request.

Any WA issues must be directed to your TA and/or WA student support, <https://webassign.com/support/student-support/> immediately. Always read the Description and Instruction in each assignment and pay attention to the number of submissions allowed in each question since they are different depending on the types of the questions. True/False question has only one submission. You should always click the 'SAVE' button each time you enter an answer. The 'SAVE' does not reduce your number of submissions, it merely saves your answer in case any glitches happen, your last saved answer is kept in the system can be retrieved by your TA.

## **WRITTEN HOMEWORK:**

As you work out your online assignments, you have the opportunity to practice writing down your solutions algebraically, logically and thoroughly before you have to take quizzes and exams. Your written solution to the homework

problems are collected by your TA three times in discussion for grades. **There will be no drops** and students have to be present at the beginning of the class and stay the entire period in order to submit your homework. The work must be your own and not taken from any other sources and it is graded for completeness and accuracy. This is a good time to visit office hours if you need help with homework to master the material.

If you are present in discussion on the day of the collection but forget to bring your homework, make arrangement with your TA **before you leave the discussion**. You have 24 hours to turn in your ENTIRE homework with 1 point penalty. There are **NO MAKEUPS**. If you must be absent, contact your TA immediately (email or in person) to make prior arrangement to turn it in early, not late. It's your responsibility to get your work to your TA before the end of the discussion.

### DISCUSSION QUIZZES:

Every student is registered to attend a weekly discussion session. You must notify your TA within the first three weeks of class if you will be missing discussion class due to religious observance or participating in UF activities. See your TA ahead of time if you have court ordered obligation and other UF approved absence before you miss the discussion.

**Make-up Quizzes:** There are no make-ups, unless,

- You are participating in a UF sponsored event, for which you must bring your documentation to your TA within the first three weeks of class.
- You miss because of a religious holiday. You must notify your TA within the first three weeks of class.
- You miss because of a court-ordered obligation—see your TA ahead of time.
- You miss because of an illness—notify your TA as soon as possible.

You must miss at least three discussion quizzes with valid, documented reasons as cited above for all of your absences to be eligible for ONE makeup quiz.

The two lowest quiz grades will be dropped to compensate for any absences, including excused absences.

### **EXAMS:**

During the semester there are three mid-terms and a cumulative final, all mandatory. The mid-term exams are assembly exams which begins at 8:20PM, consist of multiple choice and free-response questions; the final exam time may change each term, consists solely of multiple choice questions. All exam dates and time are specified in the course calendar and they must be taken at the assigned date and time. If you have class or other exam conflict, please see **UF during Term Assembly Exam Policy** <https://catalog.ufl.edu/ugrad/current/regulations/info/exams.aspx>.

You must sign up with your instructor with valid document **by the end of the third week** to avoid penalty, if MAC 2312 is the course to give the conflict exam.

If you are participating in a UF sponsored event, religious observance, you may make up an exam if you sign up with your instructor with valid document **by the end of the third week** to avoid penalty. See your instructor if you have court-ordered obligation to cause you miss an exam.

If illness or other extenuating circumstances causes you to miss an exam, you must contact your instructor no later than 24 hours after the exam by email, then as soon as you return to campus, bring the appropriate document to your instructor to sign up for a make up to avoid penalty.

The conflict exam will be offered from 6:40–8:10pm on the same night as the regular exam. You will not be permitted to leave the exam room before 8:20pm. All makeup exams will be given on Wednesday, April 19th at 8:20PM. Only those who have signed up with the instructor and have received the email invitation with the location info can participate. Make up exams consist of multiple choices only.

Bubble your scantron carefully, there are 3 points penalty for incorrect UFID or Form Code. There are 3-point penalty if you do not take your exam in the assigned room for your section.



## ADDITIONAL TOPICS:

All course information will be posted on Canvas which can be accessed using the link <http://elearning.ufl.edu> . Use your Gatorlink credential to login to this site.

**One Week Policy:** All grades are posted in the Canvas gradebook (except individual WA points which are accessed through the programs directly and the H-ITT grades which are sent to you weekly in your UF emails). You are responsible for verifying all grades are accurate. You have one week after a score is available to discuss any grade concerns with your TA. There is no grades dispute after one week.

**10– Minutes Policy:** Only students who are present in the first 10 minutes and stay for the entire period are allowed to participate in class activities (including submitting clicker questions, taking discussion quizzes and turn in homework assignments). Go to the exams early since you will not be allowed into the exam if you are 10 minutes late, and no one is allowed to leave exam within the first 30 minutes.

**Office Hours:** After the first week, all TAs and instructors' office hours will be posted in Canvas. You may go to anyone's office hours that fit your schedule. We encourage you to use this valuable resource to help you stay on track and succeed. Both instructors' **LECTURES ARE TAPED**, you access them in Canvas.

Attendance is mandatory if a student wishes to master the subject. **Students are responsible for all announcements and lecture material covered in class and/or posted in Canvas.**

**Honor Code:** Academic dishonesty in any form will not be tolerated and will be treated in accordance with the policies of the University of Florida.

**Your TA is your first contact.** Students are highly encouraged communicate with the instructors after class and during office hours. If you have personal/private issues and you can not make to office hours to discuss, you may then send emails. In order to put your email in the right context, please write in the subject line: **your lecture period, TA's name and section numbers.**

**Disability Resource Center (DRC):** Students requesting classroom and exam accommodation must first register with the Dean of Students Office. This should be done at the earliest possible date.

**Extra Credit Opportunities:** All students have the same extra credit opportunities. There is no makeup on these opportunities. Please do not ask for anything you can do to pass the course. No extra credit opportunities will be granted to any individual beyond what is available for the entire class.

## ABOUT THE ONLINE ASSIGNMENTS:

For some of the students, this could be the first time seeing the challenging concepts in this course. To put these complex topics into perspectives so that students can conceptually break down the topics slowly and overtime become quicker with, the entire course is organized around a list of Learning Objectives that demonstrates mastery of various topics in the course. These objectives fall into three categories:

- **Prelecture (P)** objectives in which you will watch video, read from the textbook and work exercises to review algebraic skills, expose to the new material and to prepare yourself for the sections to come.
- **Concept Check (CC)** objectives that address basic terminology and computations based directly on theorems, definitions and examples of the section.
- **More Practice (MC)** objectives address higher-level tasks such as synthesis of multiple techniques and creative work through application.

The due dates for the WA homework are mapped out carefully so students do not forget one topic as you are learning another and helps reinforce previous knowledge.

WA assignments are spread out 3 times a week with smaller sets arranged by the topics to help students to stay more on track and to understand the focus of each topic, rather than as one larger weekly assignment. This is to encourage students to focus on in-depth mastery of each topic rather than to merely meet a weekly deadline.

## HOW TO BE SUCCESSFUL IN MAC2312

I want you to be successful in this class, I am on your side and will be working hard to make sure you always have the resources to have a clear path to success. But I cannot walk that path for you! It will take considerable effort on your part. To do this and be successful, you will need to do the following:

1. **Prepare diligently outside of class and come to class ready to work from the get-go.**

- (a) Get an early start on all assignments. (Internet is known to be down sometimes)
  - (b) Work hard, work wholeheartedly; do your homework daily.
  - (c) Review and master your lecture notes and assignments before the next class.
  - (d) Watch the lecture again and/or visit office hours if you need help. Do not let questions go unanswered.
  - (e) Do not practice until you get it, practice until you can't make mistakes.
- 2. Actually come to class and actively engaged in your learning.**
- (a) Pay attention and answer questions, at least mentally, posed by your instructor in lecture.
  - (b) Avoid inappropriate distractions in class such as Facebook texting or talking.
  - (c) Stay on top of what's going on.
- 3. Engaged and be active in your learning after class.**
- (a) Spend a minimum of 3 hours effectively studying outside of class for every hour you spend in class. So 12 hours a week preparing for this class outside the classroom.
  - (b) The time you spend on MAC2312 is to spent purposefully, with a plan for what you will master and when you will do it as well as a plan for getting help if you get stuck.
  - (c) Believe that your mathematical skills can be improved through dedication and hard work, and when you get it wrong, take it as a learning opportunity and get better by learning from your mistakes.
- 4. Practice self-guided learning.** Pay attention not only to what you are learning but how you are learning it, and you are not depending upon the instructor or anyone else to learn things. In particular:
- (a) Be aware at all times of what you are supposed to be learning.
  - (b) When you work, work purposefully. Some of the activities are ones that you make up yourself, such as study guides, similar problems to practice, even if no grade is involved.

- (c) If you see there is a gap between your abilities and the topics covered in lectures, take initiative to find things that will help you close it.

### **Free Help:**

- Calc 2 Office hours –
  - Over 30 hours/week from MAC 2312 instructors and TAs;
  - Broward Teaching Center (<https://teachingcenter.ufl.edu/vsi/>);
  - LIT 215;
  - Calc 2 Supplemental Instructor (SI);
  - Office of Academic Support (<http://oas.aa.ufl.edu/tutoring.aspx>).
- Taped lecture.
- UF Counseling Center ([www.counseling.ufl.edu](http://www.counseling.ufl.edu)).

**I want you to be successful!** Remember that you are the only person who can walk the path to your success. Your TA and I are there for you, but you need to stay on top of what's going on in class and take the initiative to reach out when you need help.

## PREREQUISITES MATERIAL FOR MAC2311, 2312

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 provides a more complete review of these essential topics.

### ALGEBRA

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

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

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

Parallelogram: area =  $bh$

Rectangular box: volume =  $lwh$

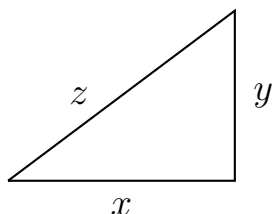
Sphere: volume =  $\frac{4}{3}\pi r^3$ ; surface area =  $4\pi r^2$

Right circular cylinder: volume =  $\pi r^2 h$ ; 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. Completing the square

$$x^2 + ax + b = \left(x + \frac{a}{2}\right)^2 + \left(b - \left(\frac{a}{2}\right)^2\right)$$

## 5. Law of exponents

$$x^n y^n = (xy)^n; x^n x^m = x^{n+m};$$

$$\frac{x^n}{x^m} = x^{n-m}; (x^n)^m = x^{nm}$$

## 6. Roots

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

## 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. Properties of logarithms

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

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

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

$$\log(n^c) = c \log(n) \quad \log_b(x) = \frac{\ln(x)}{\ln b}$$

# TRIGONOMETRY

## 1. Identities:

$$\sin(-\theta) = -\sin \theta$$

$$\cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta$$

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

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

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

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\sec^2 \theta = 1 + \tan^2 \theta$$

$$\csc^2 \theta = 1 + \cot^2 \theta$$

## 2. Sum and Difference Formulas:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

## 3. Double Angle Formulas:

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$$

## 4. Half-Angle Formulas:

$$\sin^2 \theta = \frac{1 - \cos 2\theta}{2} \quad \cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

## 5. Trigonometric Values:

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

$$6. \arctan x = \quad \text{at } x = 0, 1, \sqrt{3}, \frac{1}{\sqrt{3}}$$



## PREREQUISITES MATERIAL FOR MAC2312

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

### FORMULAS YOU ARE EXPECTED TO KNOW

1. COMPLETING THE SQUARE:

$$x^2 + ax + b = \left(x + \frac{a}{2}\right)^2 + \left(b - \left(\frac{a}{2}\right)^2\right)$$

2. PARABOLA:

$$y = f(x) = ax^2 + bx + c, \text{ vertex } (h, k), \text{ where } h = -\frac{b}{2a}, \text{ and } k = f\left(-\frac{b}{2a}\right)$$

3. CIRCLES:

$$(x - a)^2 + (y - b)^2 = r^2, \quad \text{Center at } (a, b), \text{ radius} = r$$

4. DERIVATIVES OF AN INVERSE FUNCTION:

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

5. DIFFERENTIATION/INTEGRATION FORMULAS:

$$\text{CHAIN RULE} \quad (f(g(x)))' = f'(g(x))g'(x)$$

$$\text{PRODUCT RULE} \quad (f(x)g(x))' = f(x)g'(x) + g(x)f'(x)$$

$$\text{QUOTIENT RULE} \quad \left(\frac{f(x)}{g(x)}\right)' = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\int \frac{1}{x} dx = \ln |x| + C$$

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

$$\int e^x dx = e^x + C$$

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

$$\int a^x dx = \frac{a^x}{\ln a} + C$$

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

$$\int \cos x dx = \sin x + C$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\int \sin x dx = -\cos x + C$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\int \sec^2 x dx = \tan x + C$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\int \csc^2 x dx = -\cot x + C$$

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

$$\int \tan x \sec x dx = \sec x + C$$

$$\frac{d}{dx}(\csc x) = -\cot x \csc x$$

$$\int \cot x \csc x dx = -\csc x + C$$

$$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$$

$$\int \frac{1}{\sqrt{1-x^2}} dx = \arcsin x + C$$

$$\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$$

$$\int \frac{1}{1+x^2} dx = \arctan x + C$$

$$\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$$

$$\int f(g(x))g'(x) dx = \int f(u) du$$

$$\int \tan x dx = \ln |\sec x| + C \quad \text{or,} \quad -\ln |\cos x| + c$$