

MATH 1272: CALCULUS II, FALL, 2014; LECTURES 30 AND 40

Lect 30, MWF: 1:25-2:25, AndHall 210; **Lect 40**, MWF 3:35-4:25, FraserH 101.

Lecturer: Professor Al Marden, am@umn.edu; www.math.umn.edu/~am
Office hours: MW 2:35—3:15, or by appt. VinH 326, 625-5879(voicemail)

TAs for Lecture 30

Disc. 31,34: Guosheng Fu (*fyxx165*);

Disc. 32, 35: Amit Sharma (*sharm121*); **Disc. 33, 36:** Bo Yang (*yang1173*).

TAs for Lecture 40

Disc. 41: Prithvish Kovelamdu (*kovel006*); **Disc. 42, 45:** Drusilla Hebert (*hebert*); **Disc. 43, 44:** Ashley Earls (*earls006*).

All addresses are @umn.edu

Text: Stewart, Calculus: Early Transcendentals, **7th** edition, Chapters 7–13.

Course goal. To develop basic math skills beyond the content of Calculus I.

Expected knowledge from Calculus I.

- (1) **The derivative $f'(a)$ at $x = a$ as limit of the difference ratio $\frac{f(a+h)-f(a)}{h}$ or $\frac{f(z)-f(a)}{z-a}$ as $h \rightarrow 0$, $h \neq 0$, or as $x \rightarrow a$, $x \neq a$**
- (2) Interpretation of derivative as slope of tangent line and instantaneous rate of change.
- (3) Rules for finding derivatives of more complicated functions once derivatives of simpler ones are known, namely

$$(f \pm g)' = f' \pm g', \quad (fg)' = f'g + fg', \quad (f/g)' = (gf' - fg')/g^2, \quad (f \circ g)'(x) = f'(g(x))g'(x).$$

- (4) Using these rules, and starting just with the constants, $f(x) = x$, trig functions, logs and exponentials, obtain formulas for the derivatives of all functions that can be built up from these simple ones by the operations:

$$f(x) \pm g(x), \quad f(x)g(x), \quad f(x)/g(x), \quad (f \circ g)(x) = f(g(x)), \quad f^{-1}(x).$$

- (5) Finding derivatives by implicit differentiation of equations.
- (6) How to use info about derivatives to solve max/min problems, and to qualitatively analyze graphs of functions with the help of l'Hospital's rule.
- (7) **The integral as a summation process.**
- (8) Interpretation of limits of approximating sums: areas, volumes of revolution, average values.
- (9) Functions defined by integrals; how to compute the values of such functions; derivatives of such functions.
- (10) The easy way to integrate those functions recognizable as derivatives of familiar functions.
- (11) Manipulating an integral to change its appearance in hopes the integrand will then be recognizable as the derivative of a familiar function.

Topics to be covered in Calculus II.

- (1) Integration by parts, trig substitution, partial fractions, and most importantly, techniques for approximating values of integrals.
- (2) Using integrals to find arc length, areas of surfaces, moments and centroids.
- (3) Elementary differential equations and their solutions.
- (4) Describing functions parametrically in particular by polar coordinates.
- (5) Infinite series and their convergence.
- (6) Vector geometry in 2D and 3D, lines and planes.
- (7) Vector functions, arc length and curvature.

Your TA. Your TA is your most valuable course resource. She or he is a hard working math grad student, typically not much older than you, who is taking advanced courses and seminars, perhaps doing research for a Ph.D. thesis. Part of their training is to work with students to help them learn calculus. *Help them to help you!* The job of the lecturer is to give the “big picture” and to work sample problems. The job of your TA is to go over the homework problems and to clear up difficulties and misunderstandings.

The lectures. It is in lectures that examples will be discussed, techniques for solving problems presented, and model problems worked out. The chosen problems, or similar ones, are very likely to appear on exams. The organization of material, and techniques to solve problems, might be different than in the text.

For most lectures I will have to assume that you have mastered the material in prior lectures as there will not be time to repeat the explanations. This means a lecture may be difficult to follow if you have not absorbed the previous material. Therefore to get the most out of each lecture:

- ♣ **Work out the problems assigned for the previous lectures.**
- ♣ **Look over the upcoming section**, that will help you follow what will be worked out in the lecture.
- ♣ **Ask questions** in lecture or section when you do not follow the explanation.

Homework. The key to passing the course is the practice you will get by doing the homework. We learn math by doing it! This means working out each problem yourself, since only YOU can put the math inside your head. Work additional problems if that helps you nail down the technique. If you get stuck on a problem, look at the book or your lecture notes; in most cases a similar problem is already worked out. If you still have a problem, consult a classmate, your TA, me, or go to a help room. The sooner you deal with your problem the better as we **quickly** move from one topic to the next.

Exams and quizzes. There will be three 50 minute midterm exams. EVERY Tuesday in your section, your TA will give you either a short quiz taken from the assigned homework from the previous week, OR give a midterm exam. The TAs will make out the quizzes and I will make out the midterms. The course ends with a 3 hour final common to all students currently taking Calculus II.

Calculators. No electronics will be allowed on the midterm or final exams. Nor will heavy arithmetic or algebraic simplification be required.

Grading. The final will count for 45% and the 3 midterm exams together for 45%. The borderline 10% will be assigned by your TA based on your class participation and graded quizzes. Your two lowest quiz scores will be dropped: there is no makeup for missed quizzes.

Your TA will grade your quizzes and, with the other course TAs, grade your midterms. She or he will also assign your final grade in consultation with me.

Missing midterms. If you miss a midterm exam with a compelling excuse (in advance if possible) given both to me and your TA, your final exam will be given additional weight instead.

Incompletes. We *very rarely* give the final grade of “incomplete”. To get one, *you must have completed satisfactorily all but a small fraction of course work*, have a very compelling, well documented excuse, and an approved plan to complete the course. If circumstances result in your falling behind, to avoid a low or failing grade you should seriously consider dropping the course and retaking it later.

Be aware that Calc II is substantially more difficult than Calc I requiring hard work throughout the term. If you fall behind, it will be difficult to catch up.

Lecture Schedule. (Not everything in the listed sections will be covered.)

Sept 3 to 5: §§7.1, 7.2

Sept 8 to 12: §§7.3, 7.4 (2 lectures)

Sept 16 to 20: §§7.5, 7.7 (2 lectures)

Sept 22 to 26: §§7.8, 8.1, 8.2

Sept 29 to Oct 3: Review Mon, §§8.3, 9.1 and 9.2 **MIDTERM I TUESDAY**

Oct 6 to 10: §§9.3, 10.1, 10.2

Oct 13 to 17: §§10.3, 10.4, 10.5

Oct 20 to 24: §§11.1, 11.2, 11.3

Oct 27 to Oct 31: Review Mon, §§11.4, 11.5 **MIDTERM II TUESDAY**

Nov 3 to 7: §§11.6, 11.8, 11.9

Nov 10 to 14 : §§11.10 (2 lectures), 12.1 and 12.2

Nov 17 to 21: §§12.3, 12.4, 12.5

Nov 24 to 26; Review Mon, Videos Wed; **MIDTERM III TUESDAY**, Thanksgiving ■

Dec 1 to 5: §§13.1, 13.2, 13.3

Dec 8 to 10: Review **FINAL EXAM FRIDAY DEC 12**

MIDTERM EXAM DAYS:

TUESDAY, Sept 30

TUESDAY, Oct 28

TUESDAY, Nov 25

FINAL EXAM: FRIDAY, DEC 12, 1:30 to 4:30

“You do not really understand something unless you can explain it to your grandmother” (advice to students attributed to Albert Einstein).

Assigned homework problems:

A calculator is needed to complete some problems, use it if you have one.

Section	Page	Problems
7.1	468	odd 3-17, 29, 33, 35, 37.
7.2	476	odd 1-15, 21, 23, 29, 41.
7.3	483	odd 1-11, 21, 23, 33(see p.452).
7.4 (2lect.)	492	odd 3-19, 23, 27, 29, 31, 37, 41, 45, 53.
7.5	499	5, 5, 15, 17, 19, 23, 49, 67, 71.
7.7 (2lect.)	516	5a,b, 7a,b,c, 21a, 29c, 31a,b.
7.8	527	7, 9, 13, 17, 29, 31, 37, 41, 49, 51.
8.1	543	odd 1-9, 17, 23.
8.2	550	odd 3-9, 13, 19, 33.
8.3	560	21, 23, 27, 29, 31, 35. (Only moments and centers of mass.)
9.1	584	3, 5, 7b,d, 11.
9.2	592	3, 5, 7a,b, 21, 23.
9.3	600	1, 5, 11, 19, 43, 45.
10.1	641	1, 7, 9, 15a, 33a,c.
10.2	651	5, 7, 11, 17, 41, 43, 59.
10.3	662	1a, 3a, 5a, 11, 17, 23, 29, 33, 54a,c,d.
10.4	668	1, 7, 9, 23, 45, 47.
10.5	676	3, 5, 11, 19, 21.
11.1	700	3, 11, 15, 17, 25, 37, 43, 55, 69, 77, 79.
11.2	711	15, 17, 23, odd 27-33, 43, 53, 61.
11.3	720	odd 1-23, 29.
11.4	726	odd 3-15, 29, 31.
11.5	731	odd 3-17, 23.
11.6	737	odd 3-13, 17, 21, 35.
11.8	745	odd 3-17, 23, 25.
11.9	751	odd 3-9, 15, 25, 27 .
11.10(2lect)	765	odd 5-9, 15-19, 33, 37, 47, 51, 57, 59, 63, 67.
12.1	790	3, 7, 9a, 11, 13, 15, 25.
12.2	798	9, 13, 15, 19, 21, 25.
12.3	806	1a,c,e, 5, 7, 9, 13a,b, 17, 23, 41, 47.
12.4	814	5, 13a,c,e, 15, 17, 27, 33, 37.
12.5	824	7, 11, 19, 23, 33, 45, 53, 65.
13.1	845	3, 7, 17, 19, 21, 23.
13.2	852	3, 13, 19, 21, 23, 35, 41.
13.3	860	3, 17, 23, 31.

For hints to some problems go to *stuartcalculus.com*. For review problems look to the problems done in class, the assigned problems, and the review sections at the end of each Chapter.