Math 20580

Introduction to linear algebra
and differential equations

Spring, 2019.

Course Webpage: http://www3.nd.edu/~dyer/Teaching/math20580_s19.html
Class meetings:

Section	Instructor	Meeting Time	Room
20580–01	Matthew Dyer	MWF 8:20–9:10 a.m.	DeBartolo 129
20580–02	Sonya Mapes-Szekelyhidi	MWF 10:30–11:20 a.m.	Hayes Healy 231
20580–03	Darlayne Addabbo	MWF 11:30 a.m.–12:20 p.m.	Hayes Healy 129
20580–04	Jay Shah	MWF 3:00–3:50 p.m.	Hayes Healy 127
20580–05	Matthew Dyer	MWF 9:25–10:15 a.m.	DeBartolo 129
20580–06	Laurence Taylor	MWF 12:50–1:40 p.m.	Hayes Healy 117
20580–07	Laurence Taylor	MWF 2:00-2:50 p.m.	Hayes Healy 117

Tutorial section meetings:

Tutorial Section	TA	Meeting Time	Room
22580–11	Whitney Liske	R 11:00–11:50 a.m.	Pasquerilla 114
22580–12	Whitney Liske	R 9:30–10:20 a.m.	O'Shaughnessy 117
22580–21	Hari Rau-Murthy	R 11:00–11:50 a.m.	O'Shaughnessy 116
22580–22	Hari Rau-Murthy	R 2:00–2:50 p.m.	Hayes Healy 231
22580–31	Grant Goodman	R 3:30–4:20 p.m.	Pasquerilla 109
22580–32	Grant Goodman	R 12:30–1:20 p.m.	Hayes Healy 231
22580–41	Song Gao	R 3:30–4:20 p.m.	Hayes Healy 229
22580–42	Song Gao	R 2:00–2:50 p.m.	O'Shaughnessy 115
22580–51	Jens Kjaer	R 9:30–10:20 a.m.	O'Shaughnessy 116
22580–52	Jens Kjaer	R 12:30–1:20 p.m.	Nieuwland 184
22580–61	Zhao Gao	R 12:30–1:20 p.m.	Pasquerilla 105
22580–62	Zhao Gao	R 9:30–10:20 p.m.	O'Shaughnessy 115
22580–71	Zhao Gao	R 11:00–11:50 a.m.	Haggar 212
22580–72	Grant Goodman	R 2:00–2:50 p.m.	O'Shaughnessy 117

Instructor and TA contact information:

Instructor or TA	Section	Office	Email
Matthew Dyer	20580–01/05	140 Hayes-Healy	dyer@nd.edu
Sonja Mapes–Szekelyhidi	22580–02	228 Hayes-Healy	smapes1@nd.edu
Darlayne Addabbo	20580–03	279 Hurley	daddabbo@nd.edu
Jay Shah	20580–04	106 Hayes-Healy	jshah3@nd.edu
Laurence Taylor	20580–06/07	206 Hayes-Healy	taylor.2@nd.edu
Whitney Liske	22580–11/12	295 Hurley	liske.2@nd.edu
Hari Rau-Murthy	20580–21/22	235 Hayes-Healy	hraumurt@nd.edu
Grant Goodman	20580–31/32/72	253A Hayes-Healy	ggoodma1@nd.edu
Song Gao	22580–41/42/62	219 Hayes-Healy	sgao1@nd.edu
Jens Kjaer	22580–51/52	289 Hurley	jkjaer@nd.edu
Zhao Gao	20580–61/62/71	219 Hayes Healy	zgao1@nd.edu

Instructor and TA office hours

Instructor or TA	Office Hours	Room
Matthew Dyer	W 1:30-2:30, F11-12	140 Hayes-Healy
Sonja Mapes–Szekelyhidi	TBA	228 Hayes-Healy
Darlayne Addabbo	W 12:30–1:30, F 12:30–1:30	279 Hurley
Jay Shah	Tu 11-12, W 4-5	Hayes Healy 106
Laurence Taylor	M 4–5, Tu 1–2	206 Hayes-Healy
Whitney Liske	M 2-3, F2-3	Hurley 153
Hari Rau-Murthy	W 7–9	Hurley 153
Grant Goodman	Tu 3–4, W 2–3	Hurley 153
Song Gao	Tu 3–5	Hurley 153
Jens Kjaer	M 3–5	Hurley 153
Zhao Gao	Th 5–7	Hurley 153

You may attend any of these office hours, not just your instructor's or TA's. Note that all TA office hours are held in the new Math Help Room,

https://math.nd.edu/undergraduate-program/math-help-rooms/

in Hurley 153. The Math Help Room is available to provide help to students in Math 20580 (and other math courses) even outside scheduled Math 20580 office hours. It is open Monday through Thursday 1 p.m.-9 p.m., Friday 1 p.m.-4 p.m. and Sunday 7 p.m.-9 p.m.

Textbooks:

- Linear Algebra, and its applications, 5th edition, by David C. Lay, Steven R. Lay and Judi J. McDonald, Addison Wesley, 2015, ISBN 978-0-134-01347-3

- Elementary Differential Equations and Boundary Value Problems, 11th edition, by William E. Boyce and Richard C. DiPrima, Wiley, 2012, ISBN 978-1-119-37575-3

Course description:

What is linear algebra? Functions and equations that arise in the "real world" often involve many tens, hundreds or thousands of variables, and one can only deal with such things by being much more organized than one typically is when treating equations and functions of a single variable. Linear algebra is essentially a "language for accounting" that's been developed just for this purpose. We will learn methods for solving equations and ways of understanding their solutions that are very effective when the equations are what is called (of course) "linear". In a kind of analogical way, we will even learn to "visualize" many-dimensional situations.

What are differential equations? Many functions that come up in applications do so only in an indirect fashion. That is, rather than being told what the formula is for a function, one is given some (differential) equation relating the function to one or more of its derivatives. For instance, a bank does not advertise a formula for the amount of money in a hypothetical account. Instead it advertises an interest rate, which is a way of saying how the amount of money in an account will change with time. The main goal in studying a differential equation is to understand the function it applies to. In simple situations one can use the equation to determine a formula for the function. In more complicated ones, when formulas are impractical or impossible, one can still try to answer specific question, like "what happens to the function when the independent variable becomes large? does the function also become large? small?" etc.

What will we cover? We will spend 2/3 of the semester on linear algebra, covering chapters 1 through 6 in Lay's book. The remaining 1/3 of the semester (and the entirety of Math 30650, should you take it) will be spent on differential equations. In this semester, we'll cover Chapters 1 through 3 of Boyce and DiPrima. Time is short, and we won't have much time to discuss applications of the math we are learning, particularly the linear algebra. So we highly encourage you to look at the chapter introductions and some of the "application" sections (e.g. 1.6) in Lay's book. One can plausibly argue that linear algebra is the fundamental tool in modern applications of mathematics, used to determine airline schedules, rank webpages in search engines, compress or encrypt electronic data, model the flow of oil underground, and so on and on and on.

Course Schedule: On the course webpage listed above, a tentative schedule of the material to be covered in each class is available. (Please note there will be no Math 20580 classes on Monday January 21 because of the University's Martin Luther King Day events.) You are expected to read the material before the class. We will not necessarily cover all the details of the section. Please come to class with questions about the aspects you did not understand from

your reading and for which you still need clarification after or during the in-class lecture.

Homework: On the webpage, a list of the homework assignment for the material covered in each section is given. You should attempt the problems the day that they are assigned, and seek help on those aspects of the material you are not understanding so as not to fall behind. Homework is generally due in your Thursday tutorial, with special arrangements for submission on exam days, or when necessary because of Easter or the end of classes. Late homework will not be accepted. The homework submitted must be stapled: no loose pages.

Tutorial and Quizzes: There will be a tutorial each Thursday of classes except for midsemester exam days (February 14, March 7 and April 18). Tutorials *will* be held the first week of classes. Most weeks, you will have a short quiz in tutorial to help you stay current with the material, except for the first week. The first week's tutorial will be concerned with practicing row reduction, which is a basic skill required for much of the course.

You are expected to attend every class including your assigned tutorials. Excessive absences may result in lowering your grade and even failing the course. There will be no makeups on quizzes; if you have an *excused* absence for a quiz, that quiz will simply be disregarded in your assessment (0 points awarded from a possible 0 points for that quiz).

Exams: There will be three midterm exams and a final exam. Calculators will not be allowed on exams. Exams may be made up only with an excused absence from the Assistant Vice President for Residence Life. Mid-semester or end of semester travel plans, marriages or graduations of friends and family etc are not considered an acceptable excuse for absence from an exam. Exam conflicts involving mid-semester or final exams or exams worth 15% or more of the final course grade (i.e. 2 or more such exams simultaneously, 3 or more in a single day, or 4 or more in a 24 hour period) must be resolved well in advance of the exam date. You must submit an eForm available through the academic eForms app on Inside ND or at

https://Facademic-eforms.nd.edu/

at least one week before the exam to allow time to resolve the conflict. Please check your courses' exam schedules, and submit the eForm as soon as you become aware of any such conflict(s). Athletes should notify their athletic advisor of their exam schedule, so if an excused athletic absence falls on an exam day, your advisor can make arrangements to administer the exam to you while you are away. Students with disabilities wishing to take exams at the Sara Bea Center should make arrangements to do so well before the first exam.

The Math 20580 exam schedule is:

Exam	Date	Time	Room
Ex 1	R 2/14	8:00–9:15 a.m.	Stepan 101
Ex 2	R 3/7	8:00–9:15 a.m.	Sections 01, 03, 04, 05 (instructors Dyer, Addabo, Shah): DeBartolo 101
			Sections 02, 06, 07 (instructors Mapes-Szekelyhidi, Taylor): DeBartolo 102
Ex 3	R 4/18	8:00–9:15 a.m.	Sections 01,03, 04, 05 (instructors Dyer, Addabo, Shah): DeBartolo 101
			Sections 02, 06, 07 (instructors Mapes-Szekelyhidi or Taylor): DeBartolo 102
Final	W 5/8	1:45-3:45 p.m.	TBA

Exam review sessions will run as follows:

Exam Review	Date	Time	Room
Ex 1 Rev.	W 2/13	7–9 p.m.	Debartolo 101
Ex 2 Rev.	W 3/6	7–9 p.m.	Debartolo 101
Ex 3 Rev.	W 4/17	7–9 p.m.	DeBartolo 101
Final Ex Rev.	Sun 5/5	7–9 p.m.	DeBartolo 101

Grades: Your course grade will be based on your total score out of 550 possible points:

Homework	Quizzes	Exam 1	Exam 2	Exam 3	Final Exam	Total
60 pts	40 pts	100 pts	100 pts	100 pts	150 pts	550 pts

The lowest scores giving an A-, B-, C- and D grade for each midsemester exam will be announced after the exam to give an indication of your performance. In fairness to all students, your course grade simply reflects how well you have done overall in the assessed course activities and instructors are not at liberty to adjust your grades because you (or even they) think that you could have done better in other circumstances.

Honor Code: Notre Dame students are expected to abide by the Academic Code of Honor Pledge: "As a member of the Notre Dame community, I will not participate in or tolerate academic dishonesty." The homework, quizzes and all exams are conducted under the honor code. Exams and quizzes are closed book and are to be done completely by yourself with no assistance from others. Although collaboration on homework is encouraged, directly copying the work of others without contributing to working out the solution or fully understanding the work constitutes an infringement of the honor code. Discussing quizzes with other students on Thursday before the final tutorial ends at 4:20 p.m. is also a violation of the honor code.

Please note that exams end precisely at the indicated times; you are to stop work immediately and hand in the exam at that time. You should make sure all work is complete and your multiple choice answers are marked correctly by the time the exam ends. In fairness to all students, you will not be allowed to

mark or correct answers after the exam ends, and no credit will be given for
mismarked multiple choice answers.