Math 13 - Linear Algebra
Santa Monica College – Spring 2019
TTh 5:15-6:35pm (Section 4267)
Room MC 73

Instructor: Dr. Andrew Nestler
Office: MC 61
Contact: (310) 434-8515, http://homepage.smc.edu/nestler_andrew/
Class Homepage: http://homepage.smc.edu/nestler_andrew/math13/math13.htm
Office Hours: MW 1:30-2:00pm, T 3:30-5:00pm, Th 4:35-5:05pm; and Math 13 workshop Th 3:30-4:30pm in MC 84B. These are for drop-in assistance. No appointments are necessary.

Personal Statement: In my classes, **each student has the right to feel comfortable asking questions**, making mistakes and offering good guesses and correct solutions. I understand that students learn at different rates and respond to a variety of instruction methods. **It is important to me that we all be courteous to and respectful of one another.**

Catalog description: Topics include matrices and linear transformations, abstract vector spaces and subspaces, linear independence and bases, determinants, systems of linear equations, and eigenvalues and eigenvectors.

Text: Ron Larson, *Elementary Linear Algebra*, 8th ed., Houghton Mifflin, 2017

Prerequisite course: Math 8 (Calculus 2)

Entry skills: Prior to enrolling in Math 13, you should be able to:

1. Solve systems of equations using Gaussian elimination.
2. Write the equation of a line in parametric form.
3. Prove mathematical statements by methods including proof by contradiction and mathematical induction.
4. Integrate and differentiate functions including functions defined by infinite series.
5. Evaluate, manipulate and interpret summation notation.
6. Given a function, over an interval, be able to prove algebraically the existence of its inverse function by formally proving that the function is one-to-one.
7. Be eligible for English 1.

Course objectives: Upon successful completion of Math 13, you should be able to:

1. Apply the concepts and theorems of linear algebra to show the consequences of a given definition.
2. Perform matrix computations and apply matrix algebra.
3. Express a matrix as a product of elementary matrices and an upper triangular matrix.
4. Compute the inverse, if possible, of a square matrix, and express it as a product of elementary matrices.
5. Solve any size system of linear equations using Gaussian elimination, and, where necessary, express solutions using parameters or as a linear combination of basis vectors.
6. Apply fundamental determinant theorems.
7. Prove whether or not a set and operations form a vector space (or subspace).
8. Apply the concepts of linear independence and spanning to find a basis for a vector space.
9. Prove whether or not a function between two vector spaces is a linear transformation or isomorphism.
10. Find the matrix representation of a linear transformation with respect to two given ordered bases.
11. Express the kernel and range of a linear transformation as a span of basis vectors.
12. Compute the eigenvalues for a matrix, find a basis for the corresponding eigenspaces, and where possible, diagonalize the matrix.
13. Use the Gram-Schmidt process to compute an orthonormal basis of a space.

Student Learning Outcome: Students will apply definitions and theorems of linear algebra, with topics including linear independence, spanning, dimension, subspaces and linear transformations to establish consequences of new definitions, prove additional results, and illustrate arguments with specific examples.

Homework: Most days I will give a list of suggested homework exercises. In order to succeed in this course, it is important to spend a considerable amount of time and effort to solve these exercises and write careful solutions and proofs. At times I may announce that certain homework exercises will be collected for careful grading. On the day it is due, homework is to be turned in by 5:15pm, at the start of class. **Late homework does not receive credit**. It is important that your work be neat and coherent, in addition to being mathematically correct. Part of your grade will be based on the completeness and legibility of your work. Your work should be very clear and precise. **I suggest that you write drafts of solutions on scratch paper and then recopy your final solutions neatly,** as you would when preparing an essay for an English class. In general, answers should be accompanied by clear explanations. Full credit is given for correct and complete solutions only. Please see the Homework Guidelines and Checklist page for more information.

Exams and Quizzes: There will be two in-class midterm exams and three short in-class quizzes. The approximate dates are:

Quizzes: Thursday, February 21; Thursday, March 14; Thursday, May 30
Exams: Thursday, March 21; Tuesday, April 30

Exams/quizzes must be taken on schedule or earlier with instructor permission. Exceptions to the schedule may be made on a case by case basis for students with disabilities.

The final exam will be cumulative and will be at 3:30pm on Thursday, June 6, according to the page

http://www.smc.edu/EnrollmentDevelopment/Admissions/Pages/Final-Exam-Schedules.aspx

All you need to bring for exams/quizzes is pens or pencils, and perhaps an eraser. You will do all of your writing on paper provided to you. Scratch paper, notes, books, calculators and electronic devices are not permitted. Ordinarily you are expected to show all relevant work for full credit, and indicate and explain your answers clearly. **Solutions presented during lectures are models for your work.** Unless you think that there is a typographical error, or you are unable to read part of the exam/quiz, you may not ask any questions during an exam/quiz. You will be told in advance which material may be covered on an exam/quiz.

Grading: The grading scheme is as follows:

Homework and quizzes	20%
Each midterm exam	25%
Final exam	30%

There are no make-up exams/quizzes. **If you do not take a midterm exam** then, in a first such instance, your score for that exam will be the same as your score on the final exam. Missing additional exams results in scores of zero on those exams. A score of zero assigned due to academic dishonesty will not be replaced by the final exam score.

Your final course grade is based on your total T of points out of 1000 given by the formula $T = 10H + 2.5E + 3F$, where H = homework/quiz average out of 20; E = sum of 2 midterm exam scores out of 200; and F = final exam score out of 100. Some homework/quiz scores may be dropped prior to computing the homework average; the number of scores to be dropped will be determined after the final exam is given. No exam score is dropped. Any opportunities for extra credit will be announced to the class. With one exception, the following scores will guarantee you the corresponding grades:

Points	Letter grade	Meaning
900-1000	A	Excellent
760-899	B	Good
640-759	C	Satisfactory
500-639	D	Passing, less than satisfactory
0 – 499	F	Failing

The exception is that if your score on the final exam is less than 50% then you are not guaranteed a course grade of C or higher. If an illness, accident, emergency, or special circumstance beyond your control prevents you from taking the final exam, and if you are passing the class with a grade of C or higher, an Incomplete grade (I) may be approved. There is no additional information regarding grading. Requesting special grading consideration due to your transfer plans or other personal situations is inappropriate and may result in disciplinary action.

Attendance: You are responsible for all material covered and all announcements and assignments made at each class, whether you are present or not. Therefore, **I recommend that you share contact information with at least one other student in this class**, so that you can find out what you missed in the event of an absence**.** According to SMC policy, students who do not attend each class meeting of the first week may be withdrawn. Unexcused absences may result in your being withdrawn from the course. It is your responsibility to withdraw from the course if you wish to do so. It is important to come to class on time. Students arriving late cause distractions and may miss important announcements in addition to course material; therefore, **late students may be prevented from attending class**.

Email: I may answer questions about the course material sent to my email address nestler_andrew@smc.edu. Here are the rules that apply when sending me email for this purpose:

(1) To ensure that I distinguish your email from unsolicited spam, send the message using an SMC student email address, which you may obtain for free using Corsair Connect at http://www.smc.edu/cc

(2) Include the course designation "Math 13" in the subject line, and your first and last name and SMC ID number in the body of the email.

(3) Send me an email only to ask questions about the course material.

Email messages that do not follow these rules may be deleted without being read and do not guarantee a response.

Classroom Conduct: When you come to class, please ensure that your phones are silenced and put away. **Please do not use or check phones when class is in session.** This will help ensure that you are enjoying and contributing to a learning environment free of behavior that could cause a distraction for you, your classmates or me. **Failure to respect this instruction may result in your being removed from the classroom for up to two class meetings.** If there is a serious need to leave your cell phone on, such as a family emergency, please put it on vibrate and let me know. If you leave the classroom to take a call, I'll understand why.

Laptops, tablets and other devices may be used in class for educational purposes such as viewing a digital copy of the textbook, taking notes, performing calculator functions, and looking up definitions in a dictionary. **All devices should be silenced.** Photos or recordings may not be taken without prior permission. Devices should not be used for any other purpose, including texting or emailing, accessing social media or surfing the Web, and gaming. If a peer tells me that your actions on your device are distracting during a lecture, **you may lose the privilege of using your device in class.**

Food, gum and beverages, other than water, are not allowed in the classroom.

Dr. Nestler – Math 13 - Homework Guidelines and Checklist

Your goal when answering homework problems is to explain your correct solution carefully. In general, **solutions you see during the lecture are models for your work**. In order for an assignment to be eligible for full credit, make sure it satisfies the following guidelines and checklist.

Does your completed homework assignment:

- Clearly restate the problem to be solved? (**Begin your solution by writing the instructions**.)
- Define all variables and symbols that are not in the problem as stated?
- Contain justifications of each step of your arguments?
- Use correctly spelled English words, mathematical notation, punctuation and grammar?
- Solve the question that was originally asked?
- Have a **metal staple** if it contains more than one page?

Appearance: Rewrite or type your solutions neatly. You may find that you need to rewrite your solutions more than once. Use paper that has a clean edge rather than paper ripped out of a notebook, having a ragged edge. If you have crossed out writing that is not part of your final solution, you should recopy that solution neatly and turn that in instead. If you write with a pen, use black or blue ink and write on only one side of the paper. You may write on blank or lined paper, but not graph paper.

True/False Questions and Answers: For true/false questions, if the statement is true, then you must find a general reason why this is so. A specific example is not sufficient, but a theorem and page number from the book, or a statement such as, "You proved it in class," will suffice. If a statement is false, then you must find a specific example that disproves the statement; this is known as a counterexample.

Plagiarism and Cheating: While I encourage you to work with others, you must write up your solutions in your own words. You must give proper reference and credit to others. Examples: "I worked with John on this"; "This example was Joan's idea." Submitting someone else's work as your own is known as plagiarism and is a form of cheating that is a serious violation of the college's Code of Academic Conduct.

The only resources you may use while working on homework are: your instructor, your fellow students in this class, the instructional assistants in the SMC Math Lab, our textbook, and your notes. You may not go online or ask other people for help on the homework.

It is cheating to use other books or manuals or electronic sources or to ask other people for assistance unless they are students in our class or tutors in the Math Lab. **It is cheating** to let someone else in the class view or borrow your work for the purpose of copying all or part of it. **It is cheating** to view or borrow someone else's work for the purpose of copying all or part of it.

A final comment: You should take pride in your proofs and solutions. Take care to make sure they are legible, complete and correct. The reader thanks you, and you will be grateful as well when you are studying for an exam and wish to review your previous work.

Important College Policies

Withdrawal Policy: It is your responsibility to make sure that all conditions of eligibility are met. According to the schedule of classes, Saturday, May 11 is the last day to withdraw from a class with a guaranteed W. Withdrawn students will not be readmitted except in case of administrative error. Auditing classes (attending while not enrolled) is not permitted. **If you are thinking of dropping the class, please contact me** so that we can talk about your progress in the course and about your options.

Codes of Conduct: All SMC students are required to affirm their commitment to the College Honor Code. As testament to your commitment and readiness to join the Santa Monica College academic community, you and all students are expected to uphold the Honor Code. By enrolling in courses at SMC, you are certifying the following statement:

> *In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Santa Monica College Honor Code, Code of Academic Conduct, and Student Conduct Code. I will conduct myself honorably as a responsible member of the SMC community in all endeavors I pursue.*

I will pursue any suspected cases of plagiarism or cheating or other violations of the SMC Code of Academic Conduct, whether completed or merely attempted. An occurrence of academic dishonesty will result in a score of zero and an Academic Dishonesty Report form will be filed with the Campus Disciplinarian. If you touch your cell phone or it makes a sound in class, then you may receive a disciplinary sanction for violating the SMC Student Conduct Code, and you may forfeit the ability to acquire any available extra credit.

Tentative Schedule for Spring 2019 Math 13

Day	Suggested homework exercises (graded homework assigned in class)
T 2/12	1.1 #1-6, 11-30, 37-56, 63-66, 69, 70, 79, 80; Appendix #15-22, 27-30
Th 2/14	1.2 #7-38, 43-46, 49, 50, 59, 60, 65, 66
T 2/19	2.1 #1-48, 53-78
Th 4/21	Quiz 1; 2.2 #1-38, 57-62, 64, 65, 66bc
T 2/26	2.3 #1-26, 45-48, 69, 70, 73, 80
Th 2/28	2.3 #1-26, 31-36, 45-48, 53-60, 68-73, 76, 79, 80
T 3/5	2.2 #41-46, 55, 56, 69-78; 2.3 #67
Th 3/7	2.4 #1-42, 49-59
T 3/12	Quiz 2; 3.1 #1-32, 39-52, 54-68
Th 3/14	No classes
T 3/19	3.2 #1-20, 37-46; 3.3 #1-23, 25-28, 31-34, 37-50, 57-62, 67-80
Th 3/21	Exam 1
T 3/26	4.2 #1-42
Th 3/28	4.2 #1-50; 4.3 #1-48, 51-54, 56-58
T 4/2	4.4 #1-26, 72
Th 4/4	4.4 #27-58, 63-77
T 4/16	4.5 #1-34, 39-70, 75-82
Th 4/18	4.6 #1-11, 13-46, 64-67, 73, 74, 78
T 4/23	4.7 #1-20, 22-24, 45-53, 55-58; Ch 4 Review #9-48, 51-62, 63, 65
Th 4/25	5.3 #1-12, 25-40
T 4/30	Exam 2
Th 5/2	6.1 #1-44, 51-68, 74-79, 81, 83, 84
T 5/7	6.2 #1-30, 41-46, 57, 58, 63
Th 5/9	6.2 #47-56, 60, 64-49
T 5/14	6.3 #1-10, 37-40, 43-49
Th 5/16	7.1 #15-28, 41-44, 49-52, 55-59, 61, 62, 67-72, 79-81
T 5/21	6.4 #25-33, 35-37; 7.2 #1-5, 7-20, 23-26, 31-39, 41-48
Th 5/23	7.3 #1-16, 19-60
T 5/28	7.4 #21-28; Ch 7 Review #1-6, 9-15, 17-46, 55, 61-67, 69, 70
Th 5/30	Quiz 3; Review
Th 6/6	Final Exam 3:30pm

How to study for this class (and most mathematics classes)

Your goal when studying should be to obtain deep understanding of the material. This is difficult at first, because what you are learning is new to you. Often it takes hours of focused concentration to demonstrate mastery of course objectives. You may have heard that, typically, college instructors recommend that you spend between 2 and 3 hours studying for each hour spent in the classroom. But how should your study time be spent? Should you start with the first assigned homework problem and work your way forward? In my opinion: No. There is much work that you can (and should) do in between attending class and beginning work on a homework assignment.

Before you start trying to solve a single exercise from the textbook:

1) Read through your notes from class. Typically a lecture introduces new concepts and notation, applications of the material, and examples. Sometimes your instructor will skip some steps in calculations, or omit other verification or proofs, and suggest that you fill in these blanks after the lecture; if this is the case, make certain to do this work. Make notes of any questions that you have based on your notes, and be sure to ask someone (e.g. your instructor, a classmate, an instructional assistant at the Math Lab) if you still have questions after successfully solving homework exercises.
2) Memorize any new definitions that were given during the lecture. Commit these to memory by practicing writing them down. Knowing what words mean is essential. Learning definitions without understanding them has no value. Be sure that you could illustrate a definition with some examples.
3) Read some worked examples from the textbook. Understand each step of the solution. Again, reading without understanding is pointless.

Reading through your class notes, learning definitions, and studying textbook examples could easily take 30-60 minutes or more. This is time well spent, **before** you have even begun solving homework exercises.

Remember: work without understanding is worthless. Your work on an exercise is not done just because you have matched your answer to what appears in the back of the book; instead, your goal is to obtain the correct answer and also to understand and be able to explain each step of your solution.

<u>Other actions you may take in order to improve understanding of the material (see syllabus for details)</u>

Do not isolate yourself. In the first week or two of the term, introduce yourself to some other students in the class, and share contact information. Try to study or at least discuss the course material with fellow students. As the course goes on, reach out to additional students who appear to be successful.

Visit your instructor during office hours. These are times that the instructor sets aside in order to answer your questions on course material and provide feedback on your written work. No appointments are necessary. You may be able to ask questions on course material remotely, e.g. via email.

You may study and ask questions in the Math Lab (MC 84), where you also may make appointments for private tutoring appointments. For many courses, you may have the option of attending Supplemental Instruction (SI) sessions that are run by students who have achieved success in those courses and who are paired with particular instructors teaching those courses. Some instructors hold shared office hours that are available to all students taking particular courses.

Long story short: In a transfer-level math course, there is a lot for you to do to achieve success, but also, at SMC, you have many opportunities for obtaining assistance that you might need in order for you to reach your goals.

Some information for me

Please fill out this entire page and return this entire syllabus to me on the first day of class. You may obtain another copy of this syllabus from our class homepage.

Print your name:

SMC ID number:

Have you enrolled in Math 13 at SMC in a previous term? If yes, when?

How did you place yourself in this course? Circle one of these four options:

- Grade of C or better in Math 8 at SMC
  - If yes, please give your grade, teacher's name and when you took it:

- Grade of C or better in a Calculus 2 course at another school
  - If yes, please give the school's name and your grade:

- SMC Math Assessment Test
  - If yes, when did you take the test?

- Counselor waiver
  - If yes, please explain why you have a waiver:

When did you last successfully complete a math class (examples: "Fall 2018," "Three years ago"), and what was it?

Are you currently enrolled in high school?

Do you have a bachelor's degree?