Study Guide for Mathematics 2360, Section 121 (Fall 2020): Linear Algebra

Instructor: Dmitri Pavlov, Assistant Professor
Teaching assistant: Mason Springfield
Syllabus: https://dmitripavlov.org/notes/2020f-2360-syllabus.pdf
This study guide: https://dmitripavlov.org/notes/2020f-2360-guide.pdf
Digest: https://dmitripavlov.org/notes/2020f-2360-digest.pdf
Homework: https://webwork.math.ttu.edu/webwork2/f20dpavlovm2360s121/
Discussion board: https://ttu.blackboard.com/
Course website: https://dmitripavlov.org/#teaching

1 Class modality

There are two types of online classes at Texas Tech: synchronous and asynchronous classes.

- Synchronous classes are scheduled in a specific time slot, e.g., MWF 10–11. Real-time lectures involving interaction with students happen during this time slot.
- Asynchronous classes are not scheduled in a specific time slot. Per university regulations, all lectures in asynchronous classes must be prerecorded and cannot involve real-time interaction.

Per departmental regulations, all online undergraduate mathematics classes, including this one, are asynchronous.

There are numerous possibilities for interaction in the asynchronous mode, as explained below.

2 Textbook

The official textbook for the class is Ron Larson's Elementary Linear Algebra. No access code is necessary or will be used in class. The ISBN numbers below are hyperlinked to a search engine, where one can find affordable printed copies: 8th edition (ISBN 1305658000), 7th edition (ISBN 1133110878, 1133111343). Electronic PDF files of this textbook can be easily located online.

3 Grading

The final grade takes into account homework (done using WeBWorK), two midterms, and a final exam. See the syllabus for more information about homework, exams, and grading.

4 Homework

All homework is done in the WeBWorK system, user names and passwords were distributed on the first day of semester. Homework website: https://webwork.math.ttu.edu/webwork2/f20dpavlovm2360s121/

If you are experiencing persistent difficulties with a WeBWorK problem (in some rare circumstances this may be caused by defective software), or simply need help with the mathematics involved, you may contact the teaching asistant (Mason Springfield) using the "Email instructor" button at the bottom of each problem.

5 Midterms and the final exam

Two midterms and a comprehensive final exam will be administered on dates indicated in the syllabus as take-home open-book exams. You will have an interval of 24 hours to complete the exam.

6 Teaching assistant

This class has a teaching assistant, Mason Springfield, who will answer your questions about mathematics, including anything that can be found in the textbook, homework assignments (in particular, the WeBWorK system), and exams, as well as questions about grading of individual problems on exams.

7 How to ask questions

For questions about homework, simply use the "Email instructor" button provided by WeBWorK for each problem. This enables us to see what problem you are working on right away, which makes it much easier to communicate.

Office hours are online, in the form of emails, discussions at the Blackboard website, and video chats scheduled via email. In addition, review sessions will be held via video chat during exam weeks.

Every week, our TA Mason Springfield organizes online Q&A sessions on Tuesday and Thursday at 2 pm.

Questions about mathematics, textbook, homework (and the WeBWorK system), exams, and grading of individual problems on the exams should be addressed to the teaching assistant, Mason Springfield (mason.springfield@ttu.edu).

Questions about enrollment, dropping class, user names and passwords, missed exams, and other administrative matters should be addressed to the class instructor, Dmitri Pavlov (dmitri.pavlov@ttu.edu).

8 The Learning Center

The Learning Center at Texas Tech offers tutoring for this class, their website is https://www.depts.ttu.edu/soar/lc/.

This semester, they offer both online and face-to-face tutoring.

The tutor's name for 2360 is Evan.

In-person tutoring takes place in Drane Hall 164, 4:30–7:30 pm on Tuesday and Thursday.

Online tutoring can be accessed via https://go.ttu.edu/support-tutoring, 9:15–11:15 am on Monday, Wednesday, and Friday.

9 Blackboard discussion board

This class has a Blackboard discussion board, which can be located by logging in to https://ttu.blackboard.com/.

10 Schedule

The course starts on August 24 and ends on December 2. The final exam is on December 4.

The following schedule may be subject to change as the semester progresses.

Chapter and section numbers refer to Larson's textbook. Optional supplementary videos and handwritten notes are included for each chapter.

Week 1 (August 25): §1.1 (Introduction to Systems of Linear Equations), §1.2 (Gaussian Elimination and Gauss-Jordan Elimination).

Videos for Chapter 1:

Lecture 1: video, notes.

Lecture 2: video, notes.

Week 2 (August 31): §2.1 (Operations with Matrices), §2.2 (Properties of Matrix Operations).

Week 3 (September 7): §2.3 (The Inverse of a Matrix), §2.4 (Elementary Matrices).

Videos for Chapter 2:

Lecture 3: video, notes.

Lecture 4: video, notes.

Week 4 (September 14): §3.1 (The Determinant of a Matrix), §3.2 (Determinants and Elementary Operations), §3.3 (Properties of Determinants).

Videos for Chapter 3:

Lecture 5: video, notes.

Lecture 6: video, notes.

Week 5 (September 21): First review week and midterm.
Friday, September 25: Midterm 1

Week 6 (September 28): §4.1 (Vectors in $\mathbf{R}^n$), §4.2 (Vector Spaces), §4.3 (Subspaces of Vector Spaces).

Week 7 (October 5): §4.4 (Spanning Sets and Linear Independence), §4.5 (Basis and Dimension).

Week 8 (October 12): §4.6 (Rank of a Matrix and Systems of Linear Equations), §4.7 (Coordinates and Change of Basis).

Videos for Chapter 4:

Lecture 7: video, notes.

Lecture 8: video, notes.

Lecture 9: video, notes.

Lecture 10: video, notes.

Week 9 (October 19): §5.1 (Length and Dot Product in $\mathbf{R}^n$), §5.2 (Inner Product Spaces).

Week 10 (October 26): §5.3 (Orthonormal Bases: Gram-Schmidt Process), §5.4 (Mathematical Models and Least Squares Analysis).

Videos for Chapter 5:

Lecture 18: video, notes.

Lecture 19: video, notes.

Lecture 20: video, notes.

Week 11 (November 2): Second review week and midterm.
Friday, November 6: Midterm 2

Week 12 (November 9): §6.1 (Introduction to Linear Transformations), §6.2 (The Kernel and Range of a Linear Transformation), §6.3 (Matrices for Linear Transformations).

Week 13 (November 16): §6.4 (Transition Matrices and Similarity), §7.1 (Eigenvalues and Eigenvectors).

Videos for Chapter 6:

Lecture 11: video, notes.

Lecture 12: video, notes.

Lecture 13: video, notes.

Lecture 14: video, notes.

Week 14 (November 23): §7.2 (Diagonalization), §7.3 (Symmetric Matrices and Orthogonal Diagonalization).

Videos for Chapter 7:

Lecture 15: video, notes.

Lecture 16: video, notes.

Lecture 17: video, notes.

Lecture 21: video, notes.

Week 15 (November 30): Final review week and exam.
Friday, December 4: Final exam