

# MA281: Introduction to Linear Algebra

Baker University — Fall 2023

Unless otherwise noted, each of the following sections comes from the textbook *Linear Algebra* (Third Edition) by John B. Fraleigh and Raymond A. Beauregard.

## Exam 1: Vectors and Matrices

date	day	section	topic(s)
8/23	W	§1.1: Vectors in Euclidean Space	<ul style="list-style-type: none"><li>○ vector notation</li><li>○ vector algebra</li><li>○ properties of vectors</li></ul>
8/25	F	§1.2: The Norm and the Dot Product	<ul style="list-style-type: none"><li>○ vector magnitude</li><li>○ unit vectors</li><li>○ vector dot product</li><li>○ angles between vectors</li></ul>

date	day	section	topic(s)
8/28	M	§1.3: Matrices and Their Algebra	<ul style="list-style-type: none"><li>○ matrix addition</li><li>○ matrix multiplication</li><li>○ scalar multiplication</li><li>○ matrix transposition</li></ul>
8/29	Tu	§1.4: Solving Systems of Linear Equations	<ul style="list-style-type: none"><li>○ elementary row operations</li><li>○ row-echelon form</li><li>○ reduced row-echelon form</li><li>○ Gaussian Elimination</li></ul>
8/30	W	§1.4: Solving Systems of Linear Equations	<ul style="list-style-type: none"><li>○ elementary matrices</li><li>○ row equivalence</li></ul>
9/1	F	§1.5: Inverses of Square Matrices	<ul style="list-style-type: none"><li>○ invertible matrices</li><li>○ computation of inverses</li></ul>

date	day	section	topic(s)
9/4	M	<i>Labor Day</i>	
9/5	Tu	§1.6: Homogeneous Systems, etc.	<ul style="list-style-type: none"> <li>○ vector subspaces</li> <li>○ span and linear combinations</li> <li>○ basis of a vector space</li> </ul>
9/6	W	§1.6: Homogeneous Systems, etc.	<ul style="list-style-type: none"> <li>○ row space of a matrix</li> <li>○ column space of a matrix</li> <li>○ null space of a matrix</li> </ul>
9/8	F	§2.1: Independence and Dimension	<ul style="list-style-type: none"> <li>○ span</li> <li>○ linear independence</li> <li>○ determination of bases</li> </ul>

date	day	section	topic(s)
9/11	M	§2.2: The Rank of a Matrix	<ul style="list-style-type: none"> <li>○ row rank</li> <li>○ column rank</li> <li>○ Rank-Nullity Theorem</li> </ul>
9/12	Tu	§4.1: Areas, Volumes, and Cross Products	<ul style="list-style-type: none"> <li>○ determinants</li> <li>○ area of a parallelogram</li> <li>○ the vector cross product</li> </ul>
9/13	W	§4.1: Areas, Volumes, and Cross Products	<ul style="list-style-type: none"> <li>○ volume of a box</li> <li>○ properties of cross product</li> </ul>
9/15	F	§4.2: The Determinant of a Square Matrix	<ul style="list-style-type: none"> <li>○ determinants</li> <li>○ minors of a matrix</li> <li>○ cofactors of a matrix</li> <li>○ adjugate of a matrix</li> </ul>

date	day	section	topic(s)
9/18	M	§4.3: Computations of Determinants, etc.	<ul style="list-style-type: none"> <li>○ properties of determinants</li> <li>○ computing determinants</li> </ul>
9/19	Tu	§4.3: Computations of Determinants, etc.	<ul style="list-style-type: none"> <li>○ computing the adjugate</li> <li>○ computing matrix inverses</li> </ul>
9/20	W	Exam I Review	
9/22	F	Exam I Review	

date	day	section	topic(s)
9/25	M	Exam I Review	
9/26	Tu	Exam I	

## Exam 2: Eigenvalues, Eigenvectors, and Canonical Forms

date	day	section	topic(s)
9/27	W	Characteristic and Minimal Polynomials	<ul style="list-style-type: none"> <li>○ characteristic matrix</li> <li>○ characteristic polynomial</li> <li>○ minimal polynomial</li> </ul>
9/29	F	Characteristic and Minimal Polynomials	<ul style="list-style-type: none"> <li>○ computing the polynomials</li> <li>○ relating the polynomials</li> </ul>

date	day	section	topic(s)
10/2	M	§5.1: Eigenvalues and Eigenvectors	<ul style="list-style-type: none"> <li>○ properties of eigenvalues</li> <li>○ computing eigenvalues</li> </ul>
10/3	Tu	§5.1: Eigenvalues and Eigenvectors	<ul style="list-style-type: none"> <li>○ properties of eigenvectors</li> <li>○ computing eigenvectors</li> </ul>
10/4	W	§5.2: Diagonalization	<ul style="list-style-type: none"> <li>○ diagonalizability</li> <li>○ form of a diagonalizable matrix</li> </ul>
10/6	F	§5.2: Diagonalization	<ul style="list-style-type: none"> <li>○ orthogonal matrices</li> <li>○ orthonormal matrices</li> </ul>

date	day	section	topic(s)
10/9	M	The Cayley-Hamilton Theorem	<ul style="list-style-type: none"> <li>○ the characteristic polynomial</li> <li>○ the minimal polynomial</li> <li>○ a proof of Cayley-Hamilton</li> </ul>
10/10	Tu	The Smith Normal Form	<ul style="list-style-type: none"> <li>○ the characteristic matrix</li> <li>○ computing the Smith Normal Form</li> </ul>
10/11	W	The Smith Normal Form	<ul style="list-style-type: none"> <li>○ elementary divisors</li> <li>○ invariant factors</li> </ul>
10/13	F	<i>Fall Break</i>	

date	day	section	topic(s)
10/16	M	The Rational Canonical Form	<ul style="list-style-type: none"> <li>○ invariant factors</li> <li>○ companion matrices</li> </ul>
10/17	Tu	The Rational Canonical Form	○ computing Rational Canonical Form
10/18	W	The Jordan Canonical Form	<ul style="list-style-type: none"> <li>○ elementary divisors</li> <li>○ Jordan blocks</li> </ul>
10/20	F	The Jordan Canonical Form	○ computing Jordan Canonical Form

date	day	section	topic(s)
10/23	M	Review of Canonical Forms	<ul style="list-style-type: none"> <li>○ diagonalizability</li> <li>○ diagonal matrices</li> <li>○ block-diagonal matrices</li> </ul>
10/24	Tu	Review of Canonical Forms	<ul style="list-style-type: none"> <li>○ Smith Normal Form</li> <li>○ invariant factors</li> <li>○ elementary divisors</li> <li>○ Rational Canonical Form</li> <li>○ Jordan Canonical Form</li> </ul>
10/25	W	Exam II Review	
10/27	F	Exam II Review	

date	day	section	topic(s)
10/30	M	Exam II Review	
10/31	Tu	Exam II	

### Exam 3: Vector Spaces and Linear Transformations

date	day	section	topic(s)
11/1	W	§2.3: Linear Transformations of Euclidean Spaces	<ul style="list-style-type: none"> <li>○ functions</li> <li>○ linearity</li> <li>○ properties</li> <li>○ subspaces</li> </ul>
11/3	F	§2.3: Linear Transformations of Euclidean Spaces	<ul style="list-style-type: none"> <li>○ rank and nullity</li> <li>○ matrices</li> <li>○ invertibility</li> </ul>

date	day	section	topic(s)
11/6	M	§3.1: Vector Spaces	<ul style="list-style-type: none"> <li>○ vector space definition</li> <li>○ vector space examples</li> </ul>
11/7	Tu	§3.1: Vector Spaces	<ul style="list-style-type: none"> <li>○ vector space properties</li> <li>○ vector subspaces</li> </ul>
11/8	W	§3.2: Basic Concepts of Vector Spaces	<ul style="list-style-type: none"> <li>○ span</li> <li>○ linear independence</li> <li>○ subspace tests</li> <li>○ vector space dimension</li> </ul>
11/10	F	§3.3: Coordinatization of Vector Spaces	<ul style="list-style-type: none"> <li>○ ordered bases</li> <li>○ coordinate vectors</li> </ul>

date	day	section	topic(s)
11/13	M	§7.2: Matrix Representations and Similarity	<ul style="list-style-type: none"> <li>○ matrix representation</li> <li>○ similarity of matrices</li> <li>○ change of basis</li> </ul>
11/14	Tu	§3.4: Linear Transformations	<ul style="list-style-type: none"> <li>○ properties</li> <li>○ injectivity</li> <li>○ surjectivity</li> <li>○ subspaces</li> <li>○ further examples</li> </ul>
11/15	W	§3.5: Inner Product Spaces	<ul style="list-style-type: none"> <li>○ Vector Dot Product</li> <li>○ Matrix Dot Product</li> <li>○ further examples</li> </ul>
11/17	F	§3.5: Inner Product Spaces	<ul style="list-style-type: none"> <li>○ properties</li> <li>○ Triangle Inequality</li> <li>○ Cauchy-Schwarz</li> </ul>

date	day	section	topic(s)
11/20	M	Exam III Review	
11/21	Tu	Exam III Review	
11/22	W	<i>Thanksgiving Break</i>	
11/24	F	<i>Thanksgiving Break</i>	

date	day	section	topic(s)
11/27	M	Exam III Review	
11/28	Tu	<b>Exam III</b>	

## Final Exam Review

date	day	section	topic(s)
11/29	W	Final Exam Review	
12/1	F	Final Exam Review	

date	day	section	topic(s)
12/4	M	Final Exam Review	
12/5	Tu	Final Exam Review	
12/6	W	Final Exam Review	
12/8	F	Final Exam Review	

**Final Exam:** Monday, December 11 from 3:00 to 6:00 PM in Mulvane 409