MATH 441: Matrix Algebra, Fall 2003
MWF, 10:10-11:00, 115 McAllister

Instructor: Aissa WADE
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Office Hours: M 1:30-3:30 pm and by appointment.


Topics:
Chapters 1-5 (except 1.7, 2.5, 3.5) will be covered: Matrices and Gaussian Elimination, Vector Spaces and Linear Equations, Orthogonality, Determinants, Eigenvalues, and Eigenvectors.

Prerequisite: Math 220.

Homework: Homework assignments will be collected in class weekly, usually on Friday. NO late homework will be accepted. You are encouraged to work with others on the homework, but must write up solutions individually and list on your paper students with whom you worked. Correct answers without supporting work will not receive credit. Homework assignments will be partially graded. The lowest homework score will be dropped.

Exams: There will be two mid-term exams (week six and eleven of the term) and a final exam. Calculators are not allowed on exams. Makeup exams will be given only for students with a valid documented excuse (for example, official University conflict or illness).

Grading Policy: Grades will be assigned on the basis of 450 points distributed as follows:

100 points homework
100 points midterm examination I
100 points midterm examination II
150 points final examination

Academic Integrity: All Penn State Policies regarding ethics and honorable behavior apply to this course. For details, see http://www.psu.edu/ufs/policies/
COURSE OUTLINE

1. Matrices and Gaussian Elimination
   1.2 The geometry of Linear Equations
   1.3 An Example of Gaussian Elimination
   1.4 Matrix Notation and Matrix Multiplication
   1.5 Triangular Factors and Row Exchanges
   1.6 Inverses and Transposes

2. Vector Spaces and Linear Equations
   2.1 Vector Spaces and Subspaces
   2.2 The Solution of \( m \) Equations in \( n \) unknowns
   2.3 Linear Independence, Basis, and Dimension
   2.4 The Four Fundamental Subspaces
   2.6 Linear Transformations

3. Orthogonality
   3.1 Perpendicular Vectors and Orthogonal Subspaces
   3.2 Inner Products and Projections Onto Lines
   3.3 Projections and Least Squares Approximations
   3.4 Orthogonal Bases, Orthogonal Matrices, and Gram-Schmidt Orthogonalization

4. Determinants
   4.2 The properties of the Determinant
   4.3 Formulas for the Determinant
   4.4 Applications of Determinants

5. Eigenvalues and Eigenvectors
   5.2 The diagonal Form of a Matrix
   5.3 Difference Equations and the Powers \( A^k \)
   5.4 Differential Equations and the Exponential \( E^{At} \)
   5.5 Complex Matrices, Symmetry vs. Hermitian and Orthogonal vs. Unitary
   5.6 Similarity Transformations