

Exam 1 Review

- 1.1 Linear systems
 - Row picture and column picture
 - inconsistent/consistent systems
 - 0, 1, or ∞ solutions
- 1.2 Elimination
 - (reduced) row-echelon form
 - solving systems by r.r.e.f. or r.e.f. + back substitution
 - vector form of solution sets (especially for soln's with free var.)
 - detecting inconsistent systems by row reduction
 - homogeneous systems
- 1.3 Matrices and Matrix math
 - addition, multiplying by scalars
 - multiplication of matrices - dot product, row picture, column picture
 - multiplication of matrices - dimensions
 - transpose
 - trace of a square matrix
 - Linear system in $A\vec{x} = \vec{b}$ form
- 1.4 More matrix math + inverses
 - Things that don't work the same as with real numbers
 - * $AB \neq BA$ in general (when does it work?)
 - * $AB = AC$ does not always mean $B = C$ (when does cancellation hold?)
 - * $A^k = 0$ does not mean $A = 0$
 - Theorem: if R is r.r.e.f form of A then $R = I$ or R has a row of zeros.
 - Definition of matrix inverse.
 - Inverse of product and other properties
 - matrix powers
 - transpose properties
- 1.5 Finding inverses
 - Using row reductions to find A^{-1}
 - beginning of SNOWBALL theorem
 - Why does row reduction of $[A \mid I]$ lead to the inverse? (or not?)
- 1.6 The SNOWBALL grows
 - A inv. $\Leftrightarrow A\vec{x} = \vec{b}$ has unique solution for every \vec{b}
 - A inv. $\Leftrightarrow A\vec{x} = \vec{b}$ is consistent for every \vec{b}
- 1.7 Special matrices
 - triangular, diagonal, symmetric

- 2.1 Determinants by cofactors
 - minors and cofactors
 - cofactor expansion
- 2.2 Determinants and row reduction
 - a row of zeros means what?
 - finding determinant by row reduction to triangular
- 2.3 Properties of determinants
 - Grow the SNOWBALL, $\det(A) \neq 0$
 - other properties incl. $\det(AB) = \det(A)\det(B)$
 - Eigenvalues and eigenvectors
- 4.1 Euclidean n -space (\mathbf{R}^n)
 - vectors and properties
 - norm and distance
 - dot product
 - inequalities
 - proofs about norms and distances by dot products (e.g. Pythagorean)
- 4.2 Linear transformations
 - definition of linear transformation
 - nonlinear transformations (how to check)
 - standard matrix, how to find.