

Math 313/513: content of midterm 1 (Spring 2012)

- vectors, linear combinations
- row picture and column picture of a system of linear equations
- row-reduction/Gaussian elimination to echelon and reduced echelon form; pivots, pivot columns
- solving $Ax = \vec{b}$ by row-reducing $[A \ \vec{b}]$; free variables vs. basic variables.
- finding polynomials that pass through specified points in the plane
- matrix multiplication
- interpreting row operations by multiplication by elementary matrices
- matrix inversion: theory and computation
- LU factorization (finding it, using it to solve $A\vec{x} = \vec{b}$)
- concept of vector space and subspaces, examples
- column space, and its relevance to solving $A\vec{x} = \vec{b}$
- null space, and its relevance to solving $A\vec{x} = \vec{b}$
- rank and nullity
- possible outcomes to solving determined, over-determined, under-determined systems; particular solutions
- linear dependence/independence: definition, how to test for them
- span: definition, how to test if specified vectors span a space
- basis: definition, testing if specified vectors form a basis; bases of vector spaces other than \mathbb{R}^m
- finding a basis for the null space and column space of a matrix
- dimension of a vector space and subspaces
- “fundamental theorem”: the many equivalent ways of stating that a square matrix is invertible
- Markov chains: interpreting, constructing the Markov (stochastic matrix), finding steady-state vectors
- content of lecture on Thursday, February 16th