

Math 225 M1 Exam Final Review

Definitions

- * Linear independence and linear dependence (p. 65)
- * Transpose of a matrix (p. 114)
- * Invertible square matrix (p. 119)
- * Subspace of a vector space (p. 220)
- * Span of a set of vectors in a vector space. (p. 221)
- * The null space of a matrix (p. 226)
- * The column space of a matrix (p. 229)
- * Basis of a vector (sub)space (p. 238)
- * Eigenvector of an $n \times n$ matrix. (p. 303)
- * The characteristic equation and the characteristic polynomial. (p. 313)
- * The dot product " $\mathbf{u} \cdot \mathbf{v}$ " of vectors in \mathbb{R}^n . (p. 375)

Theorems:

- * Theorem 1 (p. 15)
- * Theorem 5 - "The Spanning Set Theorem" (p. 239)
- * Theorem 12 - "The Basis Theorem" (p. 259)
- * Theorem 14 - "The Rank Theorem" (p. 265)
- * The Diagonalization Theorem (p. 320)
- * The Orthogonal Decomposition Theorem (p. 395)
- * The Best Approximation Theorem on (p. 398)

"Skills:"

- * Solve a system of equations using row operations.

- * Be able to compute when a vector is in the span of other vectors. Practice problems are from section 1.7: 9, 10
- * Be able to compute when a set of vectors is linearly dependent or independent Practice problems are from section 1.7: 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
- * Find the inverse of a matrix A using the $[A \ I]$ method. Practice problems are from section 2.2: 29, 30, 31, 32
- * Be able to multiply matrices and know when the product is not defined. Practice problems are from section 2.1: 1, 2, 3, 4, 11
- * Be able to find the parametric vector form solution of a system of linear equations. Practice problems are from section 1.5: 16, 19
- * Apply the Rank Theorem to problems. Practice problems: 4.6: 1 through 16
- * Compute determinants using cofactor expansion across rows or columns. Practice problems: 3.1: 1 - 13
- * Determine if a subset of a vector space is a subspace. Practice problems: 4.1: 5, 6, 7, 8, 9, 10
- * Finding a basis and the dimension of the Null and Column spaces of a matrix, as well as finding examples of vectors in the Null and Column space. Practice Problems: 4.2: 9, 10, 13, 14. 4.5: 13, 14, 15, 16, 17, 18
- * Finding matrices whose Column space is a specific set, or finding basis for subsets of \mathbb{R}^n . Practice problems: 4.2: 15, 16. 4.3: 11, 12
- * Find the characteristic polynomial of a matrix. Practice Problems: 5.2: 1-14
- * Find the eigenvalues of a matrix. Practice problems: 5.2: 1-14
- * Diagonalize a matrix (if possible). Practice problems: 5.3: 7 - 17
- * Find the norm of a vector. Practice problems: 6.1: 7, 8
- * Determine if two vectors are orthogonal. Practice problems: 6.1: 15 - 18

- * Find the orthogonal projection of a vector onto a subspace. Practice problems: 6.3: 3 - 10
- * Find the equation $y = \beta_0 + \beta_1 x$ of a least-squares line that fits best a given set of points. Practice problems: 6.6: 1-4