

1 Math 225 M1 Exam 3 Review

Exam 3 will cover Chapter 5 sections: 5.1, 5.2, 5.3 and Chapter 6 sections: 6.1, 6.2, 6.3, 6.5, 6.6

The exam will consist of seven questions, some having multiple parts. Each question will be worth 10 points.

Definitions

- * Eigenvector and Eigenvalue 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)
- * The norm (length) $\|\mathbf{v}\|$ of a vector \mathbf{v} in \mathbb{R}^n . (p. 375)
- * The distance $\text{dist}(\mathbf{u}, \mathbf{v})$ between vectors \mathbf{u} and \mathbf{v} in \mathbb{R}^n . (p. 378)
- * The definition of two vectors \mathbf{u} and \mathbf{v} in \mathbb{R}^n being orthogonal to each other. (p. 379)
- * Orthogonal basis for a subspace W of \mathbb{R}^n . (p. 385)
- * A least-squares solution of $A\mathbf{x} = \mathbf{b}$. (p. 409)

I may ask you to state any of the following theorems.

Theorems:

- * Theorem 1 on page 306.
- * Theorem 4 on page 315.
- * The Diagonalization Theorem on page 320.
- * The Orthogonal Decomposition Theorem on page 395.
- * The Best Approximation Theorem on page 398.
- * Theorem 13 on page 411.

"Skills:"

- * Determine if a vector is an eigenvector of a matrix. Practice problems: 5.1: 3-6
- * 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
- * Normalize a vector. Practice problems: 6.1: 9 - 12
- * 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