MATH 4242   Exam 2 Study Guide

Exam 2 will roughly cover 3.1-3.4, 3.6, 4.1-4.4, and 7.1-7.2 in Olver and Shakiban.

Topics

- inner product on a real vector space   (3.1)
- dot product on $\mathbb{R}^n$ (3.1)
- weighted dot product $\mathbb{R}^n$ (3.1)
- inner product on function vector spaces   (3.1)
- norm from an inner product   (3.1)
- Cauchy-Schwartz inequality   (3.2)
- Triangle inequality   (3.2)
- orthogonal vectors   (3.2, 4.1)
- angle between two vectors   (3.2)
- norm in general   (3.1, 3.3)
- L^1, L^2, L^∞ norms on $\mathbb{R}^n$ and $C^0[a,b]$ (3.3)
- unit vectors   (3.3)
- unit spheres   (3.3)
- equivalence of norms   (3.3)
    - just the statement of Thm 3.17, nothing beyond that
- matrix L^∞ norm   (3.3)
- positive definite matrix, positive semi-definite matrix   (3.4)
- quadratic form $x^T K x$ (3.4)
- Gram matrix   (3.4)
- complex number   (3.6)
- complex conjugate   (3.6)
- complex inner product space   (3.6)
- orthogonal and orthonormal bases   (4.1)
- Gram-Schmidt   (4.2)
- alternate Gram-Schmidt   (4.2)
- orthogonal matrix   (4.3)
- QR factorization   (4.3)
- vector orthogonal to a subspace   (4.4)
- orthogonal projection   (4.4)
- orthogonal subspaces   (4.4)
- orthogonal complement $W^\perp$ (4.4)
- cokernel, coimage of a matrix   (2.5)
- linear function $T : V \to W$ (7.1)
- change of basis formula   (7.2)

Theorems

- Cauchy-Schwarz Inequality, Thm 3.5

- Triangle Inequality, Thm 3.9

- Theorem 3.17

- Theorem 3.20

- Def 3.23, Theorem 3.24

- Theorem 3.27

- Proposition 3.31

- Theorem 3.34

- Lemma 4.2

- Proposition 4.4, Theorem 4.5

- Theorem 4.7, Theorem 4.9

- Proposition 4.19, Lemma 4.22, Proposition 4.23

- Theorem 4.32

- Proposition 4.40, Proposition 4.41, Proposition 4.44

- Theorem 4.45

- Theorem 4.49

- Definition 7.1

- Theorem 7.5

- Example 7.19 (change of basis formula)

    - See lecture notes from 7-7 to see the theorem version of the change of basis formula