

Final Exam Rough outline

This is **IN ADDITION** to the two previous review sheets:
the final is cumulative

Important: You must present your ID when you turn in your exam!! Your exam will be **REFUSED** if you do not have your ID on test day!!!!

For the portion of the final exam covering section 6, you should be able to:

- Know what an eigenvalue and eigenvector are, as well as how you find them.
- Be able to prove various facts about the eigenvalues of a matrix, based on facts about the matrix.
- Know what it means for a matrix to be diagonalizable, and know how to diagonalize a matrix.
- Understand how diagonalizability helps in iteration of matrix multiplication.
- Know what matrix exponentiation is (the definition!) and be able to compute the matrix exponential for “easy” matrices as well as diagonalizable matrices.
- Know what an inner product on a complex vector space is (we called these Hermitian inner products) and be able to prove basic facts about them.
- Be able to compute with the Hermitian transpose (i.e. conjugate transpose) and prove various facts about it.
- Know what Hermitian and unitary matrices are and be able to prove basic facts about them.
- Be able to orthogonally or unitarily diagonalize a symmetric or Hermitian matrix, respectively.
- Know what the singular value decomposition is and be able to compute it for a matrix.
- Know what a quadratic form is and how it is related to conic sections in dimension 2.
- Know what the various types of quadratic forms are in general and how we decide what type a form is from the associated matrix.
- Compute the Hessian matrix for a function, and know what it means about the local behavior of the function.